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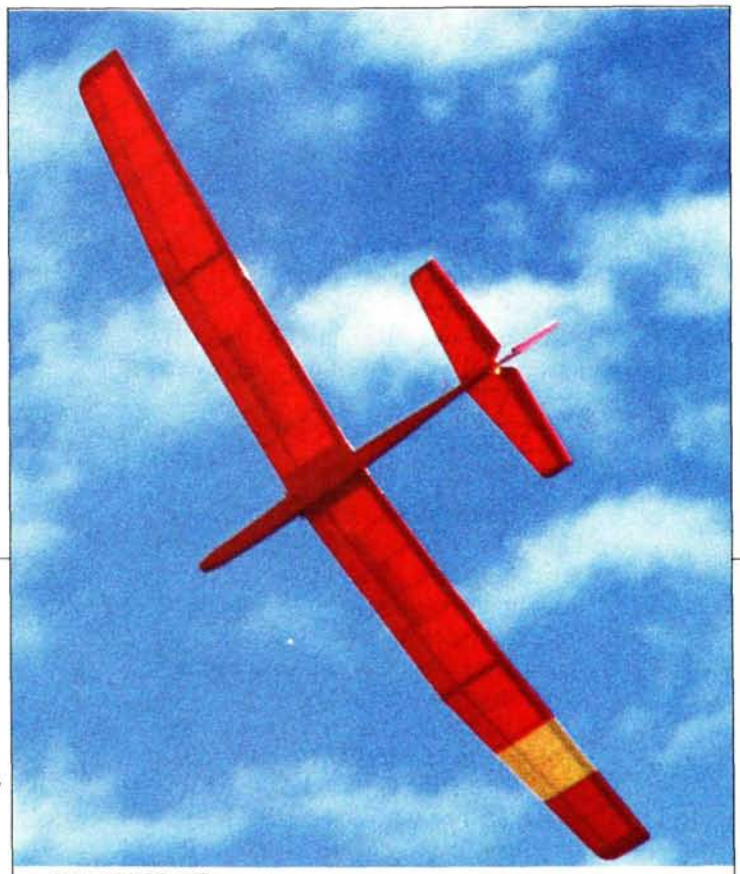
MARCH 1989 VOLUME 117, NUMBER 3

MODEL AIRPLANE



ON THE COVER:
This month's cover captures three distinct phases of the Tournament of Champions competition: the airplanes, the demonstrations and the competitors. At the top is the outstanding Skybolt of John Britt, which received the Best-Appearing Model award. Center spot is occupied by a beautiful Bell Jet Ranger skillfully demonstrated by one of the many teams on hand. Sizing up the competition from the ready box is Giichi Naruke of Japan. Flying his Reed Falcon, he finished 12th in the competition. Kodachromes by Rich Uravitch.

FEATURES

CONSTRUCTION

COLUMNS

COLUMNS

DEPARTMENTS

Model Airplane News (ISSN 0026-7295) is published monthly by **Air Age, Inc.,** 251 Danbury Rd., Wilton, CT 06897. Second class postage paid at Wilton, Connecticut, and at additional mailing offices. Subscription rates are $25 for 1 year (foreign $33), $47 for 2 years (foreign $63), $65 for three years (foreign $89). **Postmaster:** Send Form 3579 to **Model Airplane News,** P.O. Box 428, Mount Morris, IL 61054.

Airwaves

WHERE TO WRITE TO US

If you're writing to the editors (and we'd love to hear from you), please be sure to address your letters to "Airwaves" *Model Airplane News*, 251 Danbury Road, Wilton, CT 06897. Only subscription orders and inquiries are handled by our Customer Service Department in Mount Morris, IL; other mail addressed there must be forwarded to Connecticut, and this leads to long delays.

Legalizing Your Futaba

We received the following information from Frank Tiano, our "Sporty Scale" columnist. It clarifies a lot of misinformation about Futaba systems. As similar info becomes available from other radio suppliers, we'll pass it on.

Along with 88 zillion others, I own one or more Futaba radio systems. Until yesterday, I was totally in the dark as to what is 1991-legal, and I hadn't the foggiest notion of what the procedures and costs associated with upgrading my current equipment to 1991 standards would be.

After getting 14 different opinions from 13 different friends and club members, I finally decided to call Futaba.

Deborah Howard did an expert job of explaining everything I wanted to know, and, since Futaba has been inundated with calls lately, I think she welcomed the chance to explain the procedures so we could present them in print. So listen up!

• If you have an 8-channel PCM, your transmitter is already narrow-band and 1991-legal. However, you must go to your hobby dealer and purchase a new receiver—part No. R1280P. This new receiver is factory-tuned to match your transmitter. Do a range check; if your range is OK, go ahead and use the system. If your range check proves unacceptable, send your transmitter and receiver to Futaba with proof of purchase for the receiver, and they'll return everything to you after final alignment. There will be a minimal charge for the transmitter tuning only.

• If you have a 5-channel PCM, you're already 1991-certified. No upgrades needed!

• If you own a pre-1988 7-channel AM system, your transmitter needs a $10 modification and you need a new receiver—part No. R117H. All servo connectors will have to be changed to Futaba J style, or you'll have to use the new Futaba G or J adapters.

• If you own a 7-channel FM, simply purchase a new receiver—part No. R127DF and use your transmitter as is.

• Read my lips! All Futaba FM transmitters and all Futaba Pen transmitters are 1991-legal.

Hope this clears everything up for you.

Unintentional Grounding?

I really liked the Dec. '88 issue of *Model Airplane News*. I've just started flying R/C aircraft. I settled for a .40-size engine and a high-wing trainer-type aircraft to put it in. I also have a new radio that operates on Channel 44, 72.670 MHz.

My flying site is on U.S. Government land in a remote part of Arizona. I use about 50 feet of dirt runway and I'm off into the wild blue. I now have about one hour of stick time, and would like to say that R/C flying is great fun.

Once again, I need help from *Model Airplane News*. I guess that I need to join the AMA and become a responsible model aviator. After being told that even though I have a new radio, I'm still required to have an FCC license, I knew it was time to write *MAN*.

So how about it? I'm sure a lot of new readers would like to know more on this subject. For now, I've grounded my airplane, pending the solution of this paperwork dilemma, and I'd like to get back in the air as soon as possible. Any help at all will be greatly appreciated. Keep up the good work.

GARY HATTER
Payson, AZ

Gary, as far as we know, the licensing requirement for operating an R/C transmitter on approved frequencies was eliminated some time ago. Six-meter (5ZMHz) operation still requires a license, but that wouldn't affect you on Channel 44. Charge up, fuel up and go fly. RAU

(Continued on page 8)

MODEL AIRPLANE NEWS
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Airwaves

(Continued from page 6)

This is a CAP 21??

I'm enclosing some pictures of my fun-scale Mustang. This model has a 90-inch wingspan and is powered by a Sach's 3.1 engine, swinging a 20x11-inch-pitch propeller. The plane weighs 20 pounds and uses a Futaba "J" series radio on 53.5mH. The Mustang is covered with Top Flite Mustang Aluminum MonoKote. The panel lines and rivet markings are marked with a permanent marker pen. Actually, this model started with Dick Garmhausen's plans of his CAP 21. When the plane was partially built, I became disenchanted with the CAP 21 and interested in a P-51 Mustang. I compared the three-view drawings of the P-51 and the CAP 21 and noticed that there was a great similarity. I shaved the top turtle deck off the already built CAP 21 fuselage and added a T&D fiberglass P-51 cowl and modified it according to Tom Keeling's (T&D) suggestions. A Dave Platt P-51 Mustang canopy finished the look that I needed. Simply

changing the rudder and tips of the flying surfaces gave me the fun-scale Mustang that I wanted. The biggest change I made from scale was to the landing gear. Every P-51 Mustang that I've seen always had landing gear problems. Since this was going to be my fun-scale airplane, I wanted little or no maintenance, so I used a belly-mount gear (from my Godfrey 1/3 Laser.) This combination is very functional and, with the invasion stripes, it really "shakes up the troops" wherever it's is flown.

LEON SHULMAN
Metuchen, NJ

Nice job, Lee, and good hearing from you. The Mustang looks great and should provide the spark to challenge other R/Cers to turn some good flying designs into their favorite airplanes with some cosmetic modifications. The process is called "kit bashing" and is a great way to show your creativity without having to design the entire airframe.

Let's see some examples from other readers. RAU

Holland Aid Source

I'm a Dutch R/C modeler, and some club members and I intend to build a North American Mustang P-51 in 1/3 scale like the one used in the Steven Spielberg movie, "Empire of the Sun."

Do you know the address of the G.B.R.C.

Aerobatic Association that flew these birds in the movie?

I hope you can help me with this.

PH. HEYL
Kleibergstr .20
5932 SR.
Tegelen, Holland

How about it, British readers? Anyone got any information on the background of the movie star 51s? Let us know or contact our Dutch reader direct!

RAU

B-17 Kit Update

I read the letter sent to you by Scott Spencer saying he was interested in building a B17-G with .45 to .60 engines. In your response, you mentioned that "the only B-17 kit large enough would be a Wescraft." You also stated that you didn't think the kit was still available. Well, it is. Wescraft is still kitting the B-17 in an all-fiberglass kit.

Anyhow, the man has a long way to go to take on a plane of this type, if he's just starting in R/C. I've flown them and have two kits in stock. What a great airplane.

Slight correction: The stab, fin and rudder are foam on both versions.

Wescraft is located at 9626 Purline, Chatsworth, CA 91311,(818)-998-8533.

RICHARD HOFF
Weldon, CA

Thanks for the info, Mr. Hoff. Glad to hear Wescraft is still around. RAU

Aeronca Aficionado

I'm looking for more detailed information on the Aeronca C3 1931 Razorback version. I have the October '66 issue of *MAN*.

Hope you can help.

ROBERT COLBERG
Bridgewater, MA

Bob, the best source of material we know of on the entire Aeronca series is the Paul Matt presentation that's now published by SunShine House, P.O. Box 2065, Terre Haute, IN. 47802. It's part of their Aviation Heritage Library Series. RAU

Plane Memories

The cover on your January '89 issue just sent shivers up and down my spine.

I can remember back in the late '30s and early '40s being in such a pose. I know I had the same expression on my face as this lad does. Anything that could fly turned me on like a million dollars.

My thanks to you for bringing back such wonderful memories.

ROBERT N. DIXON, JR.
Waverly, NY

Predator Pardon

We received a letter from Gordon Stahl, president of the Midwest Scimitar Squadron "reminding" us that Gary Berg's

(Continued on page 12)

Editorial

by RICH URAVITCH

READER SURVEY WINNER! We've drawn a winner of the PCM radio from among all of you who submitted a completed (with name and address!) Reader Survey Form that was included in our Dec. '88 issue. Congratulations to George Riehesel of Afton, IA, who will shortly be receiving his prize: the newly introduced Futaba 5UAP PCM 1024 system. Happy flying, George!

As I said in the December editorial, "I don't know anyplace else you've got a shot at a state-of-the-art system for two bits!"

We're making our way through the huge number of Reader Surveys that you folks have sent in, and we hope to have all the data distilled shortly. Some early observations? It seems most of you really like *MAN* and the direction in which we're heading. A number of our "former" readers re-expressed their displeasure with our decision, made years ago, to discontinue our coverage of non-R/C-related modeling activities such as FF, U/C, and rubber. We certainly appreciate that input, especially since it at least indicates that the "former" readers are interested enough in *MAN* to respond to the survey. While we have no plan to return to our previous format (primarily because there are other modeling publications that cover those aspects of the hobby better than we could), we're considering re-implementing some of the things you've missed, e.g., scale three-view presentations.

Wolfgang Matts' 3rd-place-winning Ultimate, undoubtedly the most popular plane at the T.O.C. A sport version would be nice.

Many of you commented on the manner in which we present our Field & Bench product reviews—best described as "as we see it"—but a number of you seem to have difficulty accepting a review that's anything less than what amounts to a product assassination. Our reviewers have clear-cut guidelines to provide honest, objective and *informative* reports that convey their impressions without regard to "offending the advertiser." To that end, they *are* quite effective. Our policy isn't to microscopically dissect the products we review; we give our readers much more credit than that. Products brought to the market are usually the result of much work on the part of manufacturers and distributors—not flawless utopian-created entities. I've read reviewers' comments in some other publications; anticipating a specific new product, they "couldn't wait to take a shot at it"! C'mon, get serious. We've become so spoiled by products, the general quality of which is always improving, that we've become obsessed with looking for flaws to pick at.

Obviously, not all products are perfect (fact is, *few* are), but think about this: Just how much "bad press," either by word of mouth or the printed word, can an inherently bad product endure? Not much! It would be financial suicide for a manufacturer to knowingly launch a junk product into the marketplace. For example, if you've had a bad experience with something, don't you feel obliged to share your findings with your flying buddies? "This product stinks; don't waste your money!" Sure you do, and at the field or the club meeting, you can tell everyone. If your opinion is shared by a lot of other R/Cers, just how many of these "things" will the company sell? Will you eagerly buy the next product from that same outfit? Not likely. How does that decision, shared by others, affect the longevity of the company? Word of mouth is an incredibly powerful force, and the manufacturers recognize it! Sometimes, however, modelers just have to learn the sad facts on their own, regardless of available information; unfortunately, it's usually *after* laying down non-recoverable money.

So, our plan is to continue doing what most of you have expressed to be the best approach to product reviews: visual and honest appraisals that recognize the human element in everything, believe in the *intent* of most legitimate suppliers to provide quality products or that they possess sufficient integrity to make required adjustments. We *won't* insult your intelligence with meaningless criticisms, the only purpose of which is to feed the reviewer's ego. If you really care for *that* kind of product review, the kind that wastes a page by "informing" you that "one of the supplied engine-mount bolts had a burr on it that required spinning a nut on it to clean up," I'd suggest you consider the tabloid approach; they do it better than we do, after all—look how well "informed" readers of the *National Inquirer* or *Star* are!

To the overwhelming majority of you: Thanks for your comments and your support of our approach. Like a lot of R/C products, we aren't perfect, but like many of those things, we *are* getting better! ■

Airwaves

(Continued from page 9)

Predator in the January '89 issue was very similar to the long line of successful "tail-less" designs produced by the prolific Bill Evans. We agree that it's similar, but that's like saying an Aeronca Champ is similar to a Piper Cub. Unusual configurations in airplanes, like the "tail-less" Scimitar series, are evolutionary and constantly being revised.

Bill Evans has broken new ground with this *unusual configuration airplane that has allowed others, like Gary, to perpetuate the concept.* RAU ■

Twice as Hots?

This is my own design of a Midwest Hots—twin version! It's comprised of two Hots kits. Power is two Royal 45 ABCs. Needless to say, this plane will fly out of sight or knife-edge from here to next week at quarter throttle! It weighs 5½ pounds

loaded and has five channels; the fifth being for the flap, one servo for both rudders, one for both throttles, then the usual.

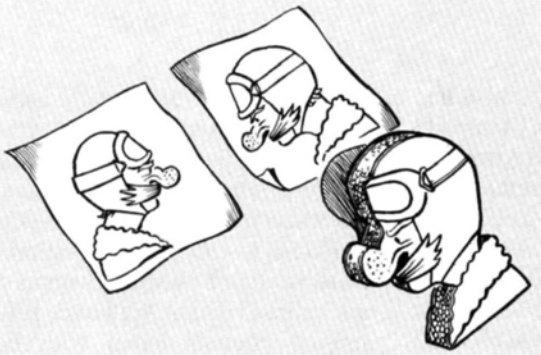
PAUL RIZKALLA
Westfield, NJ

Paul, with two .45s, I expect you'd require SPACECOM clearance every time you fly it!! It really looks good. Any readers interested in an article or how to do it? We just might be able to "twist Paul's arm!!"
RAU

We welcome your comments, opinions, and suggestions. Letters should be addressed to "Airwaves," **Model Airplane News**, 251 Danbury Rd., Wilton, CT 06897. Letters may be edited for clarity and length.

Hints & Kinks

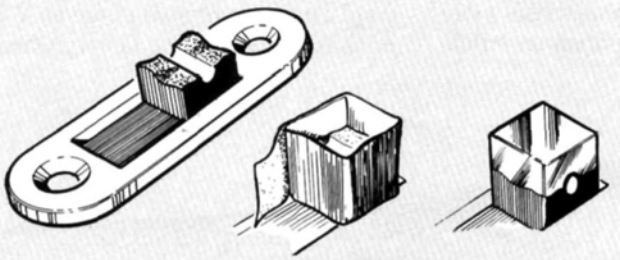
by JIM NEWMAN



SIMPLE PILOT FIGURE

It's still nice to see a pilot figure, even in the cockpit of sport models, so here's an easy method of making one. Make a Xerox copy on drafting vellum of your favorite cartoon character, then make right- and left-hand copies on regular paper. (The left-hand copy is made by flopping over the vellum original.) These are then colored, and fuel-proofed, if necessary, then glued on each side of a piece of foam board. If your Xerox scales up or down, you can make pilots up to quarter scale.

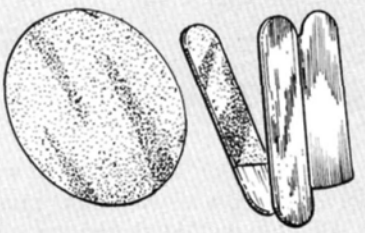
Larry Renger, Hawaiian Gardens, CA



SWITCH REPAIR

If your switch knob has been drilled for a wire pushrod, there are occasions when that knob accidentally breaks. If the switch has no other damage, it's possible to make a repair. First, be sure the break isn't contaminated with oil; if it is, clean it with acetone. Wind a tape dam around the knob, then fill the resulting mold with epoxy. (You might even try a thick, slow-setting CA.) When cured, remove the tape, then trim to shape with a fine file, re-drilling if required.

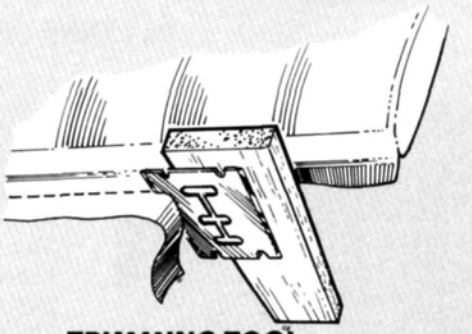
Henry A. Loos Sr., Waterford, NY



SANDING STICKS

Your auto-parts store sells self-adhesive sanding discs in various grades. Pieces of a suitable size can be cut from these discs and wrapped around tongue depressors to make very handy sanding sticks. In fact, these would adhere to variously-shaped blocks and rounds for a variety of tools.

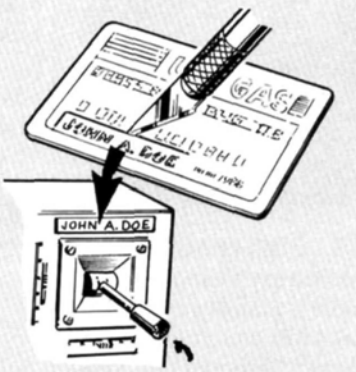
Ted Osenga, Plover, WI



TRIMMING TOOL

It isn't easy to trim a constant-width overlap on covering films—or even tissue. This simple tool will leave a neat, trimmed, even-width flap. Simply glue a suitable razor blade to a shim that's the thickness of the width of the desired seam. When using the tool, keep a little tension on the scrap material and keep the shim pressed against the leading or trailing edge.

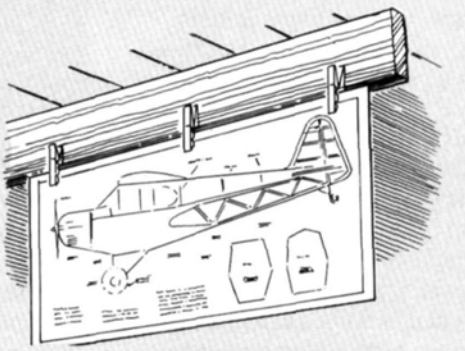
Ron Breininger Jr., Roseville, CA



TRANSMITTER NAME TAG

Before discarding your old credit cards, carefully cut out your name. This can be glued to your transmitter, or even to the side of your model's cockpit for that personalized touch. I suspect that the tag will need fuelproofing, since the printing on most plastics is far from fuel-resistant.

Brady French, East Brunswick, NJ

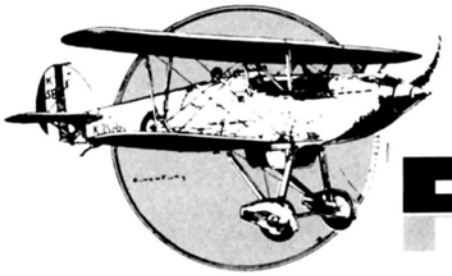


PLAN HANGING

How simple can this be? To keep your plans handy for ready reference, or just to keep them flat, CA some clothespins to the rafters of your workshop then clip the plans into place.

Brian Kretchmar, St. Peters, MO

Model Airplane News will give a free one-year subscription (or one-year renewal if you already subscribe) for each idea used in "Hints & Kinks." Send rough sketch to Jim Newman, c/o **Model Airplane News**, 251 Danbury Rd., Wilton, CT 06897. BE SURE YOUR NAME AND ADDRESS ARE CLEARLY PRINTED ON EACH SKETCH, PHOTO, AND NOTE YOU SUBMIT. Because of the number of ideas we receive, we cannot acknowledge each one, nor can we return unused material.



Fifty Years Ago.

by LYNNE SEWELL

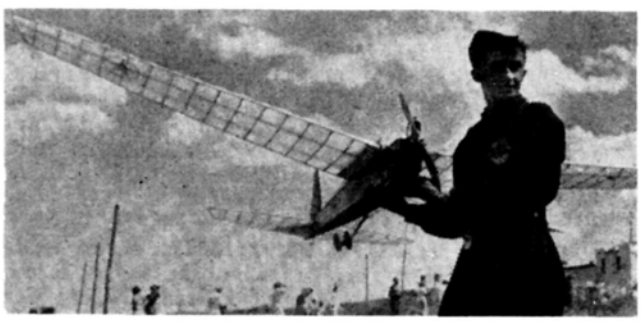
"THE CONTEMPLATED sudden expansion of our air force is almost a certainty." So wrote Robert Morrison in his March 1939 MAN column, "Frontiers of Aviation," exactly one year after Hitler's army had invaded Austria, and the same month in which it occupied Prague, Czechoslovakia. With Louis Johnson—"a true air corps enthusiast"—expected to take over as Secretary of War, Morrison accurately anticipated that aviation would "gain its rightful place in the militaristic field."

Already, in March '39, Lockheed, which only a year before had been one of the smallest aircraft companies, had an order backlog of over $30,000,000, exceeding that of even Douglas, a former leader of the U.S. aircraft industry. Orders for at least 12,000 planes were expected, and all manufacturers would be working on "super war planes." Would we have enough mechanics trained to service these planes, enough pilots to fly them, enough training planes? The Army had already called for planes that would fly at over 380mph, and as the situation in Europe worsened, the race to produce bombers and pursuit planes was on!

While Douglas had already astounded the world with its transports, it also had orders for over 300 bombers, 114 torpedo bombers, an amphibian for the Army and a twin-engine patrol bomber for the Navy. The company's DC-4 was well-established and was soon to be followed by the DC-5. Vultee had just produced a new V-12 single-engine attack plane that had a top speed of 235mph and a range of 1,200 miles. The list goes on!

In its commercial branch, Lockheed had started work on a *nose-first* 35-passenger airliner! The horizontal stabilizer and elevators were to be located in the nose, while the vertical tail would be in its usual place at the rear of the fuselage.

This issue's cover story by Robert McLarren dealt with the Fokker D-23 twin-engine pursuit plane and read more like a fictional spy story than an article you'd see in *MAN*. Apparently, at the end of WW I, a defeated Germany was to have been stripped of all its war machines. All the undelivered planes of Fokker Flugzeugwerke at Schwerin were to be delivered to certain flying fields for a "cremation." However, when Anthony H. G. Fokker first received word of the scheduled destruction of his latest models (the culmination of five years of 24-hours-a-day work), he rapidly planned to send truckloads of partially asssembled planes to the countryside, where they were hidden in cellars, barns and attics—anywhere sympathizers could hide a plane! On 60-car trains they were to be smuggled to Holland, with the cooperation of train masters, station masters, customs officials and railroad hands. Well over 100 people jingled pockets laden with Fokker's gold—all bribed to keep the lines clear for these mammoth convoys. In true spy-novel fashion, misleading information was deliberately leaked to Allied and German patrols to keep them away from the re*al* action. Did Fokker succeed? Yep! The contents of *an entire aircraft factory* were moved from one country to another while the world was looking the other way! That was the start of the N. V. Nederlandsche Fokker, the factory where the Fokker DC-23 fighter was produced.



***Above:** The Vultee V-12 attack bomber; in '39, this was one of the most versatile military planes in the world.*
***Left:** Shows what Russians were building in the '30s. This plane could stay aloft for as long as 5 hours.*

But all wasn't gloom and doom and war in the March '39 issue. In "Building the Midget Speedster," William Hadden bemoaned the fact that little progress had been made toward increasing the speeds of models since the maximum of 60mph had been achieved a decade before. The Midget Speedster, he said, would "clip time from *any* record."

(Continued on page 72)

Shannon Edmonds holds the Electriliter while Sheri Smothers checks control response prior to launching.

Wingspan: *72 inches*
Length: *41 inches*
Weight: *40 ounces*
Wing Area: *637 square inches*
Wing Loading: *9 ounces per square foot*
Power Required: *Electric, 540 series motor*
Radio Channels Required: *3 (if motor control on/off is employed)*
Materials: *Balsa and lite-ply*

ELECTRILITER

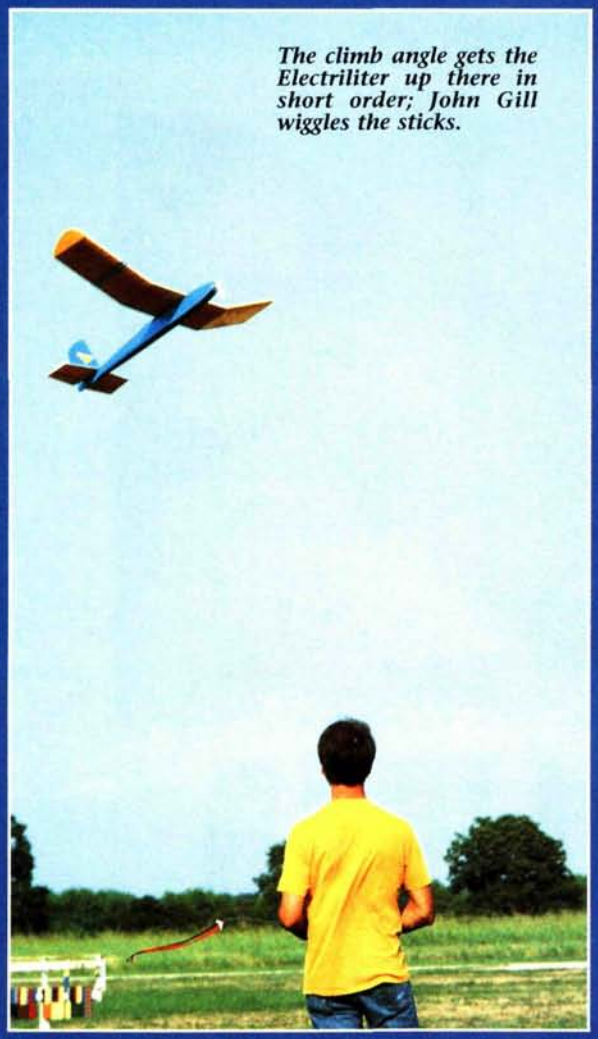
I'VE BEEN TOLD that all my airplanes look alike—usually with red or blue fuselages and yellow see-through wings. Well, I guess that's right, but when bifocals, baldness and bunions come on the scene, easily seen airplanes are the ticket to much more relaxed flying. When you have a

A time proven design shows its flexibility with electric power.

winner, you might as well stick with it!

Another winner is the Twiliter series of SRCMFFs (Simple Radio-Control Models for Fun), which started with a .049-powered machine that introduced a lot of people to R/C flying. The next generation of Twiliters were much larger airplanes powered with .10s that added throttle control and made the addition of a landing gear possible. They still had the same gentle characteristics as the 1/2A jobs, but they were easier to see and had a

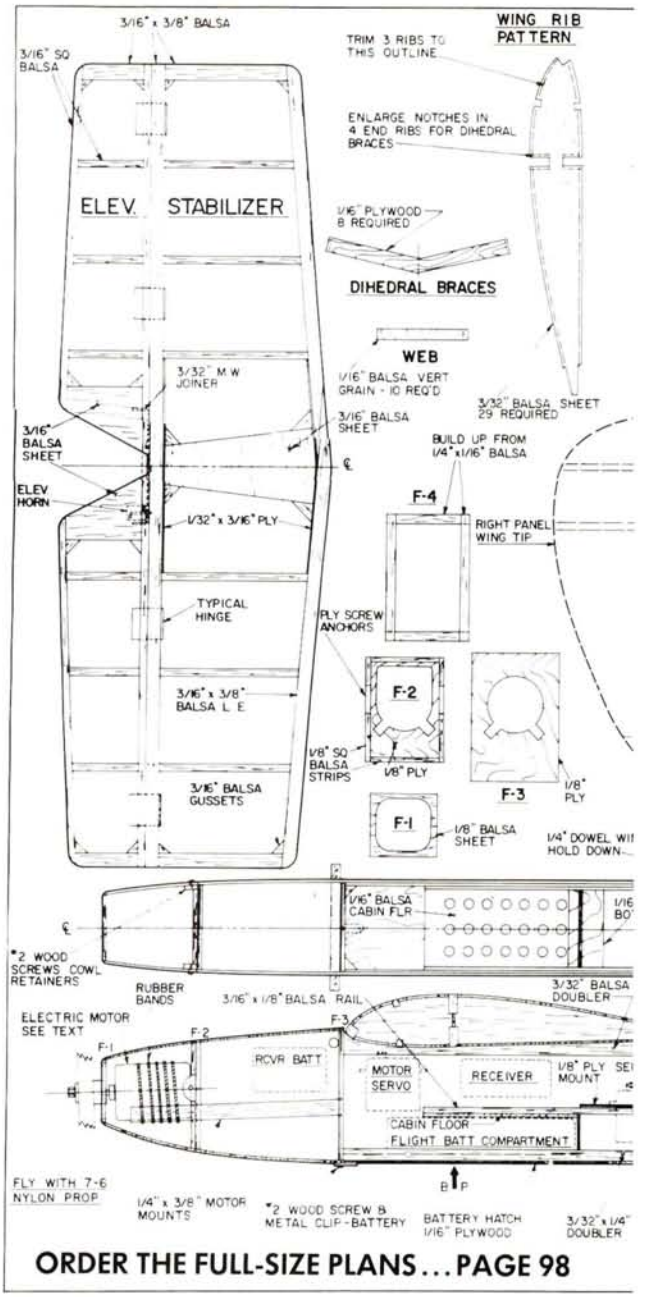
by RANDY RANDOLPH



The climb angle gets the Electriliter up there in short order; John Gill wiggles the sticks.

#3891 ELECTRILITER $11.00

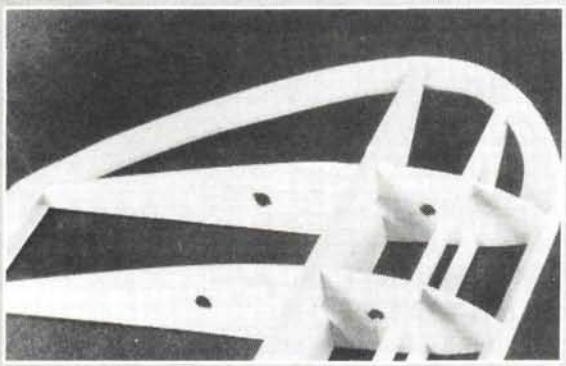
Newest in the long line of time-proven designs from Randy Randolph, this one blends all the great trainer-like qualities of the series with the silent power of electric. Easy to build and fly, it makes an ideal schoolyard subject. 72-inch span with 637-square-inch area. Three-channel radio required if motor control is desired. Single-sheet plan.



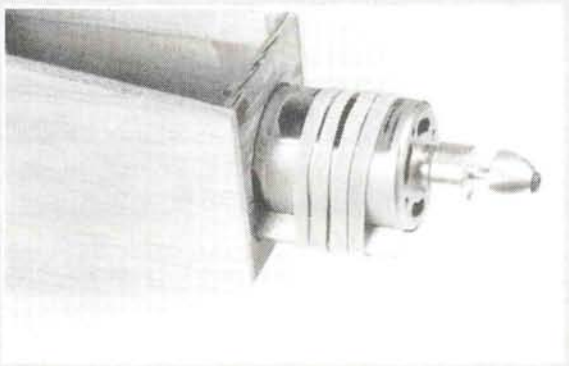
ORDER THE FULL-SIZE PLANS... PAGE 98

larger bag of tricks. A float-equipped version even does a good job of flying off water.

Both types lived up to their Twiliter names, because they could be carted off to a likely spot and launched for a quick after-work flight with little or no preparation. But for after-work flying they did have one drawback: an engine! In some areas, noise limits school-yard flying

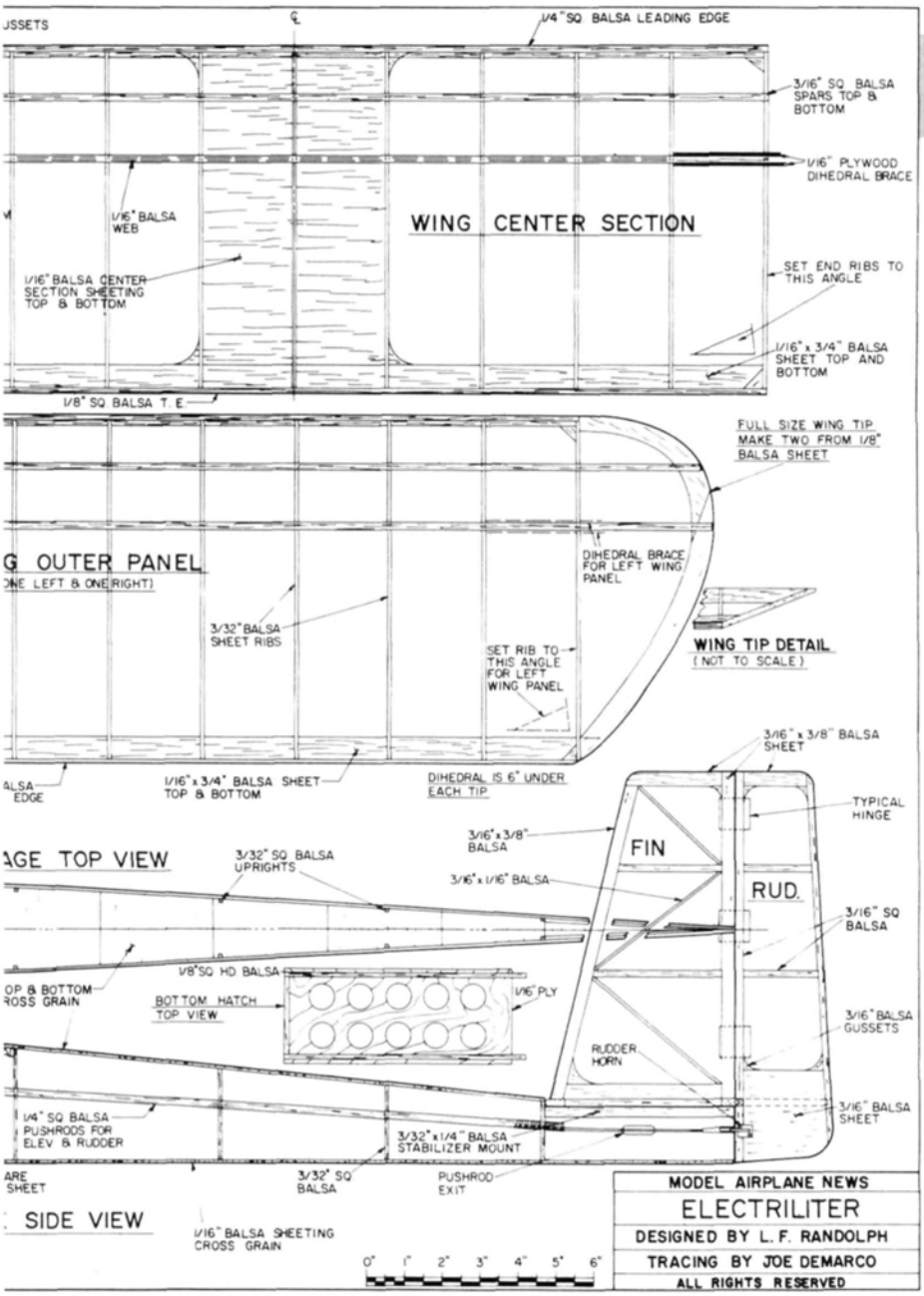


The 1/8-inch balsa-sheet tips come up to meet the top of the main spar and top front spar. Scrap spar stock extends to the tip on the lower surface.



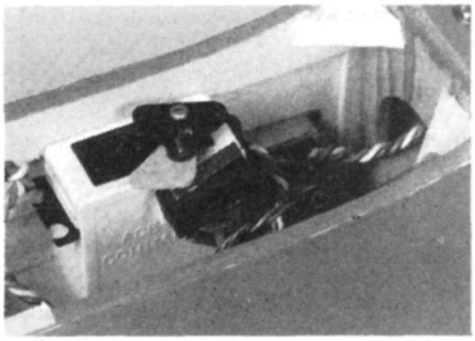
Rubber bands offer a shock mount and allow the motor to shift on impact without damaging the shaft. The motor can be moved backwards or forwards to achieve a slight balance change, if necessary.

The cowl simple box 3/16-inch tri stock reinf ments at th ners. The



(a very handy "likely spot"), and there were always the dirty hands and after-flight clean-ups to contend with, too. To overcome these difficulties, we now have the Electriliter.

The recent availability of inexpensive electric motors has given a great boost to electric power. Major kit manufacturers now provide the motor right along with the airplane (or as a low-price option), and they're dandy motors, too! Ace Radio* even offers excellent Mabuchi motors for as little as $7 and change! The Electriliter is designed for one of those kit, or "option", motors. Come to think of it, one of those car motors, with a prop adapter, would work well, too!

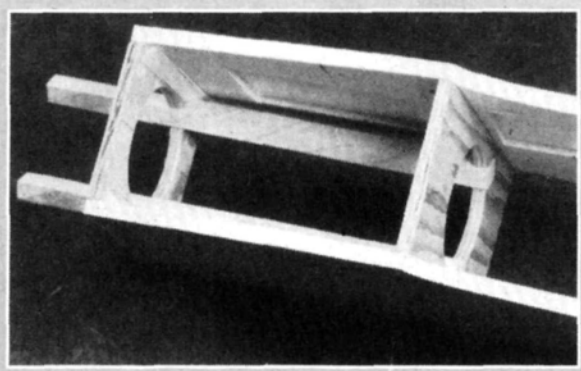


The "throttle" switch is activated by a 1/16-inch plywood extension on the servo. It's attached to the throttle servo with two-sided servo tape.

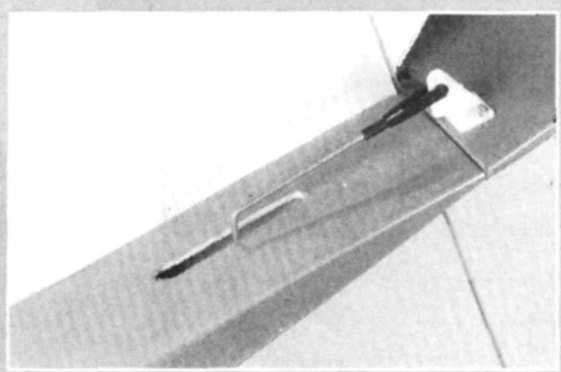
Simply putting a motor in the .10-powered Twiliter isn't the answer. One of these motors and the necessary battery aren't only *heavier* than the .10 and its tank, but they also produce somewhat *less power*. This dictates that the structure must be lighter (and, at the same time, stronger in different areas) than the glow version, and since there's also less power, a higher-lift wing with additional area seems to be in order. The changes worked just fine!

A typical flight consists of climbing way up there, killing the motor and playing on the way down, then climbing back up and doing it again. Most of the time, one charge will take it almost out of sight twice, and occasionally, when the air is cool, three times. Great fun and no noise or dirty airplane to clean. It's easy to build, too.

square balsa lder on the wall should mooth, slid-fit for the

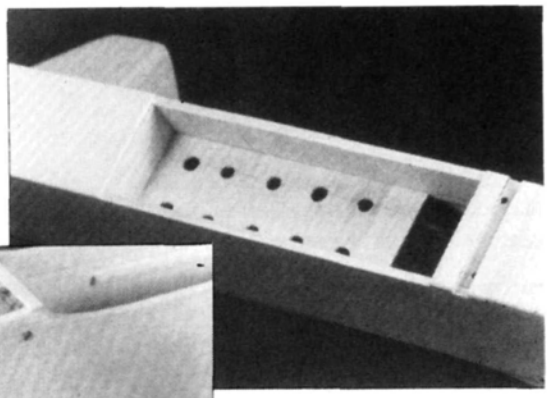


The fire wall and first cabin former hold the motor-mounting rails; the rails are slanted to conform to the shape of the motor. There's lots of room for wiring, switches, etc.

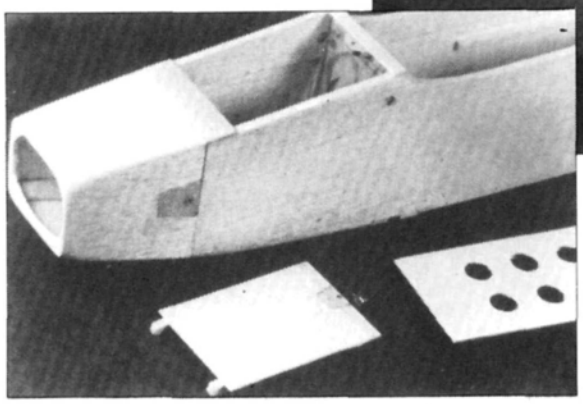


The bend in the rudder pushrod is OK for this airplane, because there's little load on the flight surfaces, but it should be avoided on higher-speed aircraft. Surfaces are hinged with the covering material.

ELECTRILITER



The floor of the radio compartment is drilled to allow more ventilation to the battery compartment. There is a free flow of air through the engine and over the flight battery.



Small plywood inlays in the cowl and top hatch reduce wear in these areas from the screws that hold them in place. Battery-hatch cover is drilled for ventilation.

CONSTRUCTION: The wing and tail surfaces are built over the plan in the traditional manner. When assembling the wing, cut an angle jig from balsa sheet and use it to set the slant of the ribs at both ends of the center section and at the inboard ribs of the tip sections, so that they'll fit the dihedral angle when joined. Don't forget to trim 1/16 inch from the top and bottom of the three center ribs so that the sheeting will be flush with the rest of the wing. To leave room for the sheeting that will follow, scrap 1/16-inch balsa can be inserted under these center ribs as you build it. When all three sections of the wing have been built, trim the spar notches in the end ribs to receive the dihedral braces. It's a little easier to assemble the tip bows before the three sections have been joined. Notice that the bows come up to match the top of the main spar and therefore conform to the airfoil.

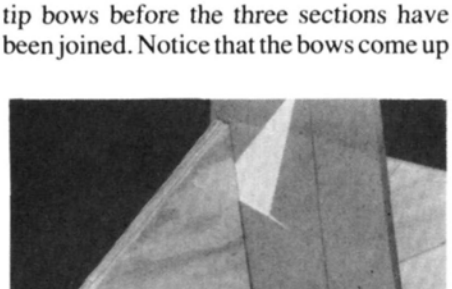
Sand the spars, leading edge and trailing edges to match the slanted ribs. Pin the center section flat on the workboard, and join the tip sections to it with the dihedral braces. There should be 6 inches of dihedral under each tip. Sand the completed wing.

Use light wood for the stab, elevator and rudder and don't forget the 1/32-inch plywood doublers at the center of the stab. Build the elevator in one piece, add the 3/32-inch wire carry-through, then trim away the spar to match the rudder notch. Sand a notch into the leading edge of the rudder spar at the elevator carry-through to clear the 3/32-inch wire.

Although the fuselage is a simple box with 3/32-inch sides and cross-grain 1/16-inch sheet top and bottom, a couple of things might need explaining:

The battery hatch is 1/16-inch plywood the full width of the fuselage, with 1/8-inch-square balsa stiffeners on both sides. The stiffeners fit into the fuselage between the bottom doublers. The hatch is held in place on the fuselage bottom by a combination of the stiffener extensions at the rear and a simple pivoting latch in front. Drill the vent holes in the plywood *before* building up the hatch. Although not shown on the plans, I added a simple torsion mount to the bottom of the fuselage just in case I want to add a landing gear

(Continued on page 73)



When they've been covered and hinged, the rudder and stabilizer can be joined before being mounted on the fuselage. Right-triangle jig blocks hold the rudder perpendicular to the stab.

Small Steps

by RANDY RANDOLPH

IT'S ALWAYS PLEASURE to write a column when there's so much of interest to report. As always, the really good things come from *you*, the people who read these "Small Steps" columns! Thank you all for the contributions you've made to modeling over the years.

Stoney Stoneman, of Garland, TX, has worked with a material with which few of us are familiar. He writes:

"Enjoyed your 'Small Steps' in Sept. '88 *MAN*—coincidental and very timely. I'd been trying to show my grandson how to make airfoils, and something you wrote seemed to turn on the light bulb.

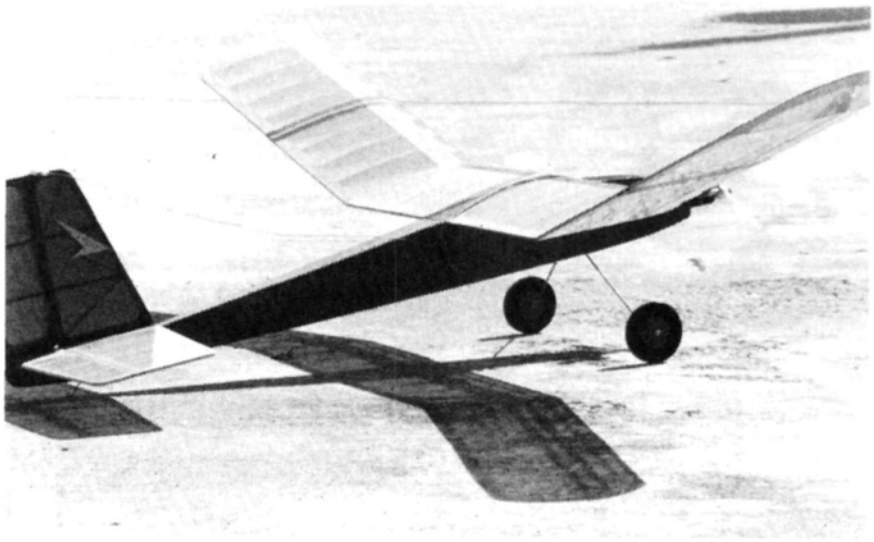
"He seems to think R/C aircraft are out of his budget. When I was 9 (he's 11), I threw papers, sold magazines and mowed yards so I could buy my first 'gassey' from Johnny Clemens—even washed airplanes for rides. I'm telling you, kids today! Well, maybe I can make an astronaut out of him.

"You should see this thing we're building—looks like it's gonna turn out OK. Balsa, $3; gear, $3; hinges and pushrods, $3; but here's the kicker: The entire plane

A lot of modelers are pipe smokers, so I thought you might like to see a little more of Paul's work.

is made of a 22x28-inch piece of poster board (35 cents). It's stressed skin as in full scale—some balsa for control surfaces, fin and stab outline and around cabin and nose. I used 1/8-inch masonite for motor mount and gear support. The fuse is 3 inches wide for the radio and servos—plenty of room.

"The really great thing about poster board is that it takes a coat of paint beautifully; simple finishing; little or no sanding. Airplane looks great as a tail-dragger. Oh, the name?—Simple Poster."



The Twiliter II with feet!

I suggested that Stoney contact our editor for some suggestions about preparing an article for good ol' *MAN*. Let's hope he does!

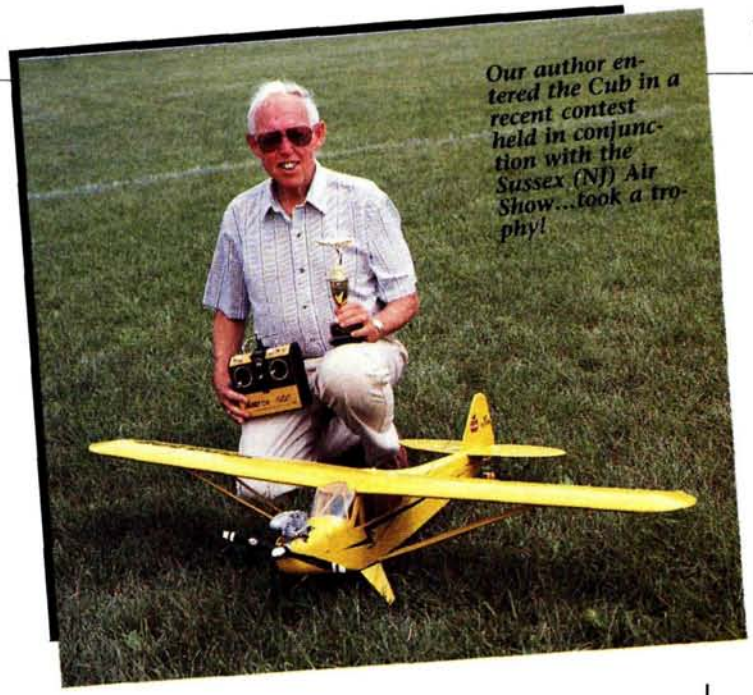
Picture No. 1 is of my friend Paul Guilland and the airplane that started our friendship—the Twiliter. Paul is a master pipe-maker from Saint-Claude, which, incidentally, is the world's main production area for pipe briar, as well as being a beautiful city in the foothills of the French Alps. I discovered that a Sasieni-made pipe I've had for a number of years was made from a briar burl that passed through Paul's hands at one time—small world! I now have a Paul Guilland pipe that's absolutely beautiful! But I digress; on to Paul's letter:

"I've seen some prolific modelers in my time, but you beat the lot. First the Twiliters I and II, now the G-Man, plus the electrics and all your columns in *MAN*. How do you find time for all this? Don't you go to bed from time to time? I sure sympathize with your Madame.

"Talking about your articles in *MAN*, and especially the 'How To,' have you ever thought of doing a 'How *Not* To' column? If so, here's my contribution: As you probably know, France has just had its presidential elections. Because of this, I set up my work table in front of the TV, so that I could watch my candidate and dabble in my hobby at the same time. The

(Continued on page 90)

Paul Guilland, Small Steps's French connection!



Our author entered the Cub in a recent contest held in conjunction with the Sussex (NJ) Air Show...took a trophy!

ARISTOCRAFT

J-3 CUB

The Aristo-Craft/Polk Blue Bird .25 2-stroke engine provides adequate power. Upright installation simplifies operation.

by CHARLIE KENNEY

THIS WAS ANOTHER fun project for *MAN*. I've always admired the J-3 Cub and saw many at local airfields as a youngster. As I opened the colorful kit box, the sight of the J-3 kit by Aristo-Craft* brought back many pleasant memories. It's a great-looking ARF kit; all the surfaces are covered with a "Cub yellow" coat, and preparation for flight is just a matter of assembly and installation of an engine and radio set. This was an all-Aristo-Craft model, using a Blue Bird 25 for power and an Aristo Hi-Tech 720 radio for control.

Before I describe the construction sequence, let me provide a bit of information on the full-size Piper J-3 Cub. The Cub was conceived in bankruptcy and nurtured in penury—a true child of the Depression—but it grew up to be a star and to make a fortune for its backers. When WW II came, the soldiers loved it too: The Cub introduced more young men into the joys of flight than any other airplane; and now, in its old age, it's still a very popular plane.

A logical choice for an ARF but this one's no trainer!

The Cub was the creation of the Taylor brothers (C.G. and Gordon). They began fabricating airplanes in upstate New York, but when Gordon died in 1928, C.G. moved to Bradford, PA. The citizens of Bradford put up $50,000 to persuade Taylor to set up shop there. Of that sum, $800 came from William T. Piper, a highly successful oil man who had never before had anything to do with aviation, but who found himself suddenly on the board of the Taylor Aircraft Corporation. But Piper, if a novice in aviation, was no beginner in business. He saw at once the market for a small, affordable airplane, inexpensive both to buy and to operate.

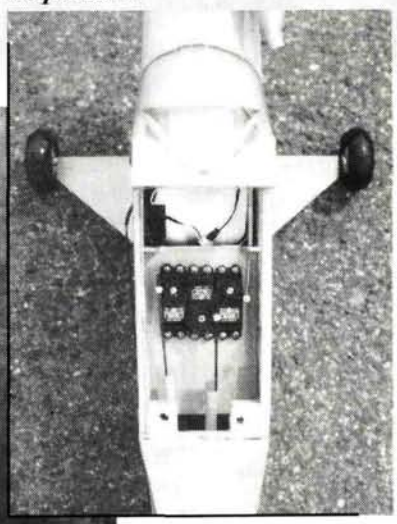
Taylor's first airplane was called the E-2 Cub. A total of 22 were sold at a price of $1,325, but only 17 were built in 1933, 71 the next year and 200 in 1935. The 500 planes produced in 1936 were of the "improved" J-2 model with an enclosed cockpit. In the spring of 1936, Piper bought out Taylor's company, but soon after that, the plant burned to the ground. Piper started again in Lock Haven, PA, in an old silk mill. Sales started to pick up again in 1937, with orders for 687 aircraft and a new, improved Cub, the J-3, was introduced in 1938. The rest is history.

The first J-3s were offered with either a Franklin, a Lycoming or a Continental engine, all rated at 40hp; over the years, all three engines were upgraded to 65hp. Then came the Civilian Pilot Training Program, and J-3 sales soared: 1,800 Cubs in 1939, 3,000 in 1940 and 3,200 in 1941. With the start of WW II, the Army recognized the value of these "Grass-hoppers" (as General I.P. Swift of the First

(Continued on page 26)

SPECIFICATIONS

Type: *Sport Scale ARF*
Wingspan: *55 inches*
Engine: (recommended) *.19-.28 R/C*
Fuselage length: *34.5 inches*
Wing area: *520 square inches*
Number of Channels Required: *4*
Weight: *3.5 pounds*



First flight of the Cub was hand-launched. Airplane proved to be a handful—even modifications couldn't tame it down to "trainer" qualities.

J-3 CUB

Calvary Brigade named them). Piper sold 5,700 "Grasshoppers" from December 7, 1941, through V.J. Day in 1945. He failed again in the post-war years but reopened with 250 employees in 1946, and planes with familiar names (Super Cub, Vagabond, Clipper, Pacer, Tri-Pacer and Colt) were produced. But there was only one legend—the J-3 Cub—and it lives on.

CONSTRUCTION: The step-by-step assembly procedure was in accordance with the 10-page instruction manual. The stab and vertical fin are first trial-fitted into the fuselage then epoxied into the fuselage. Use a square to ensure that the surfaces are at right angles to one another. Next, the elevator and rudder hinges are epoxied into place. I like to increase the safety of my

(Continued on page 46)

Rag-Wing Rhapsody

WHAT IS IT about the Piper J-3 Cub that has allowed it to endure for over 50 years and not once stray very far from the hearts of American pilots?

It has *nothing* that hasn't been done before. In fact, it wasn't even a *new* design. It was simply the result of an evolutionary process that began with C.G. Taylor's original high-wing ideas, progressed through the E-2, the J-2 and finally to the J-3.

The basic bones of the old Cub didn't change a whit during its evolution, but what really got the Cub cooking performance-wise was the availability of Lycomings and Continentals that cranked out an honest 65 horses. But this wasn't a *giant* leap over the competition, since they all had the new engines. So, what made the Cub so marvelous? The answer lies in the recipe, not in the ingredients. The Cub is a subtle blend of factors that somehow go together "right." The long flowing lines are pleasing to the eye, and the way the airplane feels in the air has set standards by which all other trainers are measured.

It isn't without its drawbacks, but these all disappear in the slipstream when cruising through an August sunset with the door open. ■

Only the wind was more fierce than the competition as 20 international R/C fliers battled for $118,000 in prize money!

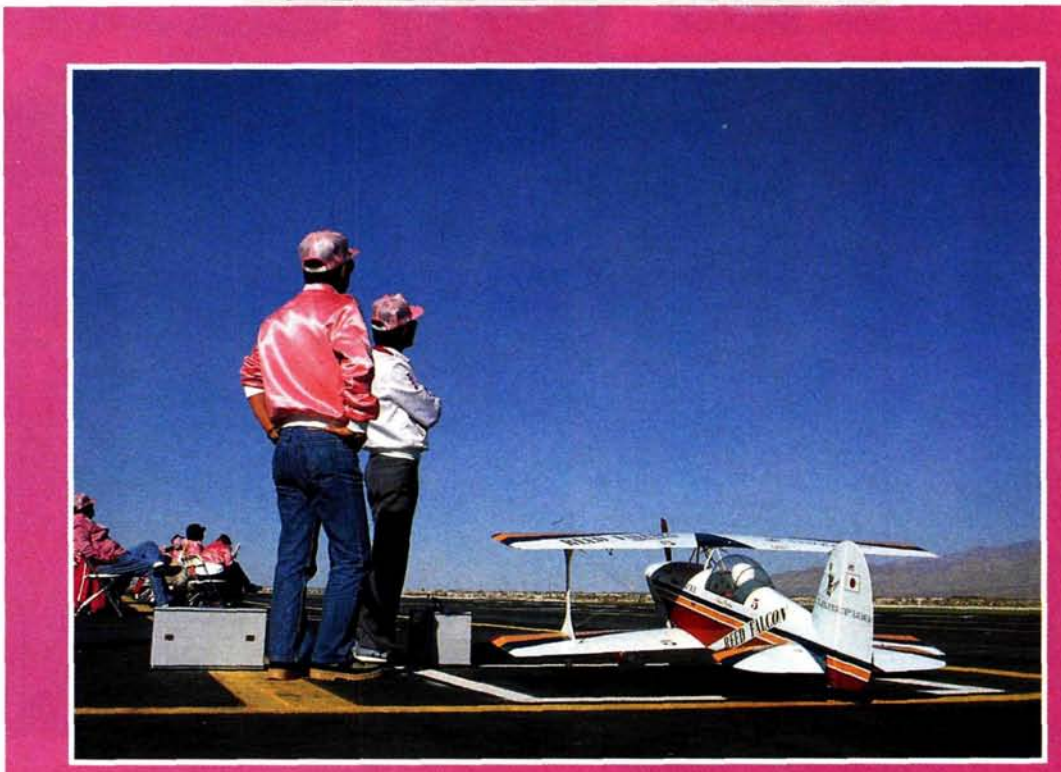
TOURNAMENT OF CHAMPIONS 1988

by RICH URAVITCH

DURING THE four-day period from November 10 through 13, 1988, a little airport in North Las Vegas, NV, saw more biplanes on hand than you'd see during a tour of the Pitts factory. The occasion was the Ninth International Tournament of Champions sponsored by the Circus Circus Hotel/Casino, and the incentive was *big*...I mean *BIG!*—like $118,000 big! Now that kind of geetas, my friends, puts our sport right up there with the big guys, and way *in front* of many of them.

So, who competes for this kind of legal tender? The best R/C fliers in the world, that's who. Twenty international competitors with demonstrated performance, plus two alternates, were invited to compete. This isn't just an up-scale, Masters-level, pattern contest; it's more like a miniature representation of a full-scale international aerobatics competition, and that's precisely the flavor that's intentionally created. Everything from the required scale-appearing airplanes to the full-scale aerobatic pilots serving as judges, right down to the Aresti, key, mandatory maneuvers and the always-exciting "Free Style" program that allows the competitors to pull out all the stops and demonstrate their "hot-dog"-style flying skills. I can honestly say that I saw things done with model airplanes that I'd never seen before, and I still can't figure out how some of it was done. Mirrors are my best guess!

This contest is structured so that the first three days are used for qualifying rounds in which all competitors fly Unknown Compul-



PHOTOS BY RICH URAVITCH

***Above:** Giichi Naruke from Japan sizes up the competition from the ready box. His Reed Falcon was beautifully prepared*

FINAL STANDINGS

Place		Airplane	Prize
1	**Hanno Prettner** (Austria)	Skybolt/Laser 200	$25,000
2	**Gordon "Chip" Hyde** (Yuma, AZ)	Ultimate Bipe	15,000
3	**Wolfgang Matt** (Liechtenstein)	Ultimate Bipe	10,000
4	**Tony Frackowiak** (Miamisburg, OH)	Ultimate Bipe	6,000
5	**Steve Rojecki** (Las Vegas, NV)	Ultimate Bipe	5,500
6	**Steve Stricker** (Baltimore, MD)	Ultimate Bipe	5,000
7	**John Britt** (Lee's Summit, MO)	Skybolt	4,500
8	**Bill Cunningham** (Broken Arrow, OK)	Ultimate Bipe	4,000
9	**Bertram Lossen** (West Germany)	Weeks Special Bipe	3,500
10	**Ivan Kristensen** (Canada)	Laser 200	3,000
11	**Dean Koger** (Xenia, OH)	Weeks Special Bipe	2,750
12	**Giichi Naruke** (Japan)	Reed Falcon Bipe	2,750
13	**Dave Brown** (Hamilton, OH)	Weeks Special Bipe	2,750
14	**Steve Helms** (El Toro, CA)	Laser 200	2,750
15	**Gunter Hoppe** (West Germany)	Extra 230	2,750
16	**Dean Pappas** (Lodi, NJ)	Laser 200	2,750
17	**Hajime Hatta** (Japan)	Ultimate Bipe	2,750
18	**Jeff Tracy** (Australia)	Sukhoi SU-26M	2,750
19	**Jon Robinson** (England)	Cap-20	2,750
20	**John Beasley** (Ireland)	Laser 200	2,750

Alternates: Dave Patrick (USA) **Peter Wessels** (W. Germany)

Special Award: Best-Looking Model Aircraft: John Britt 3,500

TOURNAMENT OF CHAMPIONS 1988

***Above:** Flight line ing early stages of qu fications. Bipla dominated event doubt helped by th percent bonus. S Stricker's Ultimat foreground had an tremely thin airfoil t*

***Left:** Hanno's series giant Laser. ARF in the Tour ment of Champi competition! Th about*

***Above:** Gunter Hoppe from West Germany flew his Extra to 15th place. All fliers scrutinized the other competitors to gain an edge.*

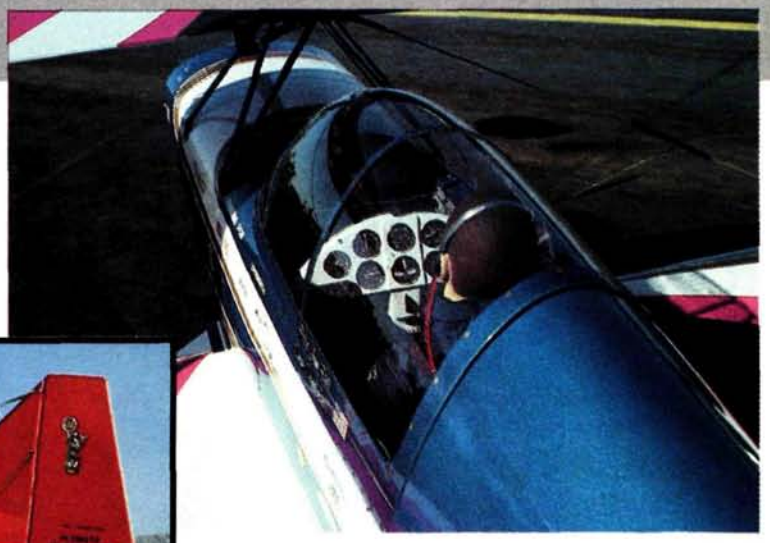
***Right:** The winner, and still champion, Hanno Prettner accepts his trophy and paycheck from Circus Circus and Hobby Dynamics executives, along with applause from the crowd.*

sory, Known Compulsory and Three-Minute Free Programs. The fourth, and final, day has the field narrowed to five finalists who then do it all over again, a number of times in the same day. During the early stages of the qualifying rounds, the flying was extremely competitive, and

the only thing that seemed for sure wa that the weather wasn't going to coope ate. By the final day of qualifying, th winds had picked up to a point whe many competitors seemed almost relieve that, after the scores had been posted, the hadn't made the "cut."

The final day had the five gladiato ready to do battle in the arena, which, t this time, was in danger of being blow away along with the tents, concession airplanes and some spectators, many whom seemed to be "blown away" befo the winds ever arrived. Party animals, doubt!

With the wind blowing nearly direct *across* the runway, some of the trickie parts of the flight sequences were th departures and arrivals! When the smo had cleared, the final standings we Prettner, Hyde, Matt, Frackowiak a



***Right:** John Britt captured the "Best Appearing Model" award. Close-up of cockpit on his beautiful Skybolt leaves no doubt why.*
***Below:** Wolfgang Matt's Ultimate bipe awaits its turn in the ready box. Some may question the design's aesthetics, but it sure does fly!*

Rojecki. Here are a few observations I made about each of them:

Hanno Prettner, from Austria, is an incredibly gifted R/C flier who brings new meaning to the term "precision" flying. He performed maneuvers during his Free Program that defy description. While this competition may be patterned after full-scale aerobatics, I seriously doubt whether the current generation of full-scale aerobirds like the Extras, Ultimates, CAPs and Sukhois driven by humans could duplicate some of Hanno's routines. Although I don't understand how he could enter both a monoplane (Laser) and a biplane (Skybolt) in the same competition, both were impeccably prepared and powered by twin ST .90s driving the prop through a gear-drive system designed and built by Hanno. The only discernible noise was that of the gears themselves, and this was more of a hum than anything else. His dedication to R/C flying is evident; he's won eight of the nine T.O.C. competitions.

Sixteen-year-old Chip Hyde from Yuma, AZ, is the kind of youngster that any dad would be proud of, and *his* dad, Merle, obviously is. Chip is a true competitor who possesses both the talent and the discipline to compete at this level. He and his dad are teamwork personified, and you could see the same "body English" used by both when Chip performed with his Ultimate bipe. The maneuver that drew the biggest crowd reaction? No question: Chip's vertically descending torque roll terminating in a sustained tail slide back to the horizontal. At the risk of sounding *too* West Coast: totally awesome, dudes!

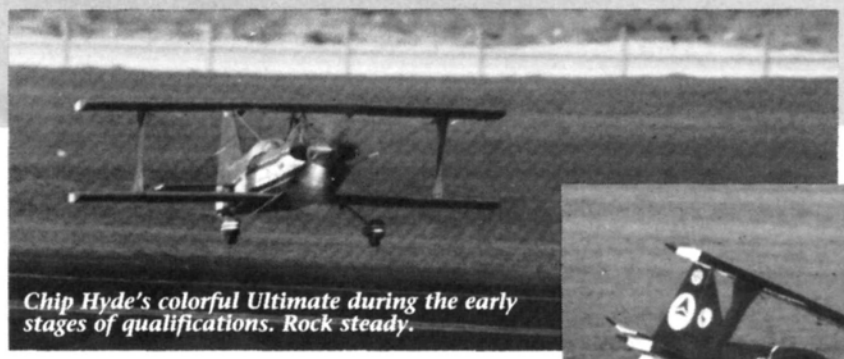
Twice World Champion Wolfgang Matt, from Liechtenstein, also chose the Ultimate biplane as his machine for this event. Wolfgang's performance is about as consistent as it comes, since he has reached the finals in *all* nine of the T.O.C.s so far. He's obviously accustomed to the requirements of competition, having won over 250 pattern competitions, both nationally and internationally.

Ohio's own Tony Frackowiak flew his Ultimate bipe extremely well. Early on in the competition, after he'd posted a score that he was less than pleased with, I asked him (Chris Economaki-style) just what he thought was the reason for his "poor" score. He confided that he hadn't put together a Free program that the judges really liked, because he considered himself to be more of a precision flier than a "hot-dogger." Well, I don't know what he did, but he came back later in the Free and

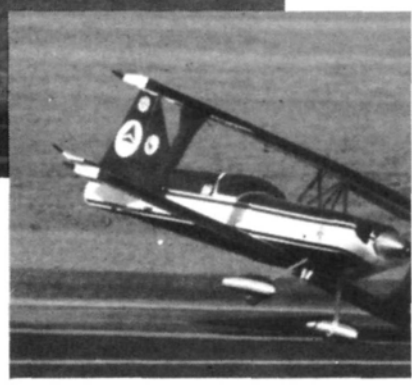
Number Two and Climbing!

THIS JUBILANT young fellow acknowledging the applause of an admiring crowd is Gordon "Chip" Hyde of Yuma, AZ. The 16-year-old Chip is an accomplished R/C flier who captured 1st place at the 1987 Masters competition, and has won a string of other top-level Pattern Meets, including placing 6th in the F3A World Championships held last year in France. (Quite a list of achievements for someone who just recently got his driver's license, and can't even vote yet!) While seemingly quiet in demeanor, Chip acknowledged his roots with a sense of humor when he accepted his 2nd-place prize at the T.O.C. by smiling and saying, "Thank you, and thanks to my mom and dad; if it weren't for them, I wouldn't be here!" All this talent and comedy, too! While trying to involve some of the younger folks in the hobby is a serious problem with which we should all be concerned, we should likewise be thankful that there's some youthful representation for the sport in the likes of the Chip Hydes of the world. ■

TOURNAMENT OF CHAMPIONS 1988



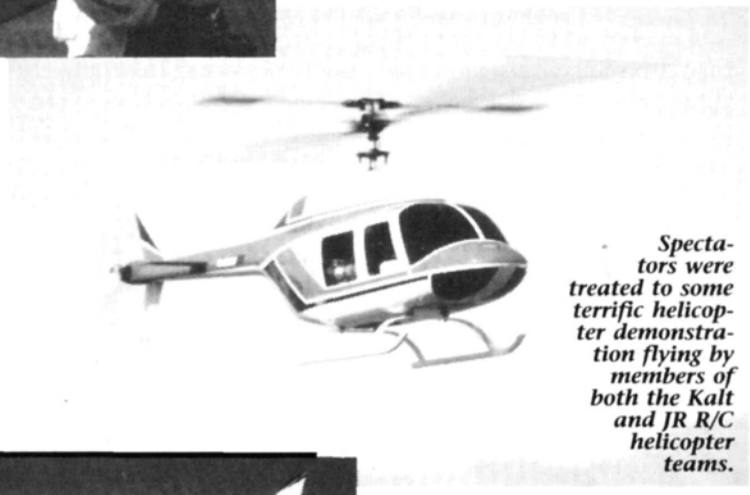
Chip Hyde's colorful Ultimate during the early stages of qualifications. Rock steady.



Steve Rojecki's Ultimate on takeoff in a brutal crosswind. Note the deflection of the various surfaces trying to get the tail and right wing down.

The Rojeckis with their Ultimate bipe. The sheer size of these airplanes is impressive.

***Above:** Wolfgang Matt, eventual 3rd-place finisher, displays the concentration required to play in this league. Low, flat position of transmitter during flying appears to be favored by the Europeans.*



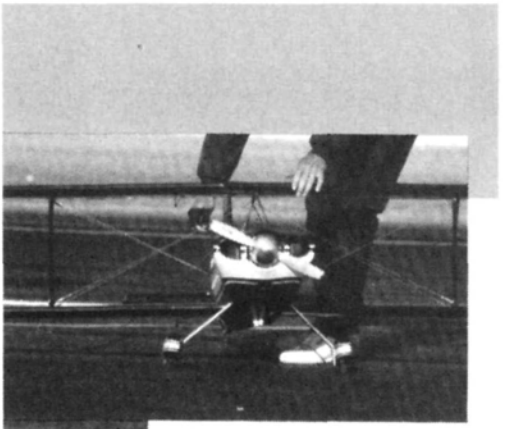
Spectators were treated to some terrific helicopter demonstration flying by members of both the Kalt and JR R/C helicopter teams.

Bob Violett and Ron Gilman were invited by contest management to demonstrate their BVM Vipers. A wise decision, as it was the exposure to many spectators of the performance of ducted fans.

demonstrated as much hot-dog ability as anyone out there.

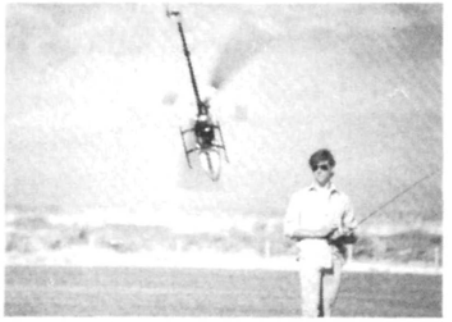
Tough-break-of-the-year award (if you consider ending up fifth in *this* field to be bad!) had to go to Steve Rojecki of Las Vegas. He's the only flier to win the T.O.C. besides Prettner. During takeoff for his final flight, the gale-force winds momentarily got his Ultimate bipe nose-down and sideways, and this shrank the propeller's diameter to a dimension just slightly larger than the Ultimate's cowling. He *did* manage to get airborne, fly one circuit and land. Scrubbed flight! The scores between 3rd and 5th places were pretty tightly grouped, so a scoreable flight might just have made a difference to the final outcome.

Interspersed throughout the four days of competition flying were various demonstration flights representing alternative forms of R/C flying, which thrilled the many spectators, myself included. Helicopter flying was demonstrated by both the Kalt and the JR teams who performed a whole repertoire of solo and formation maneuvers, including rolls as axial as ever seen—even by fixed wing standards. Have you ever seen a *backwards* loop or roll? I did...I think! They were both performed by Curtis Youngblood, the World and National Helicopter Champion. I really didn't believe that helicopters could do these things! I'm reasonably certain that real helis can't—at least, not with me aboard! I'd liken it to riding a roller coaster backwards (something I'd probably pass up the opportunity to do!).



Steve Rojecki's "modified" Zinger prop really allowed his Tartan engine to unload! Living proof that "Rs" don't necessarily improve thrust. Tough break, see text for details.

Performance of a different variety was displayed by the ducted-fan Vipers flown by Bob Violett himself and 1987 Top Gun, Ron Gilman. Their routine included a very graphic demonstration of the speed envelope of the Viper, which started with slow flight around the pattern at a speed and stability resembling many R/C trainers



The world's best helicopter flier, Curtis Youngblood, mystified the crowd with his ***backward*** *loops and other impressive maneuvers.*

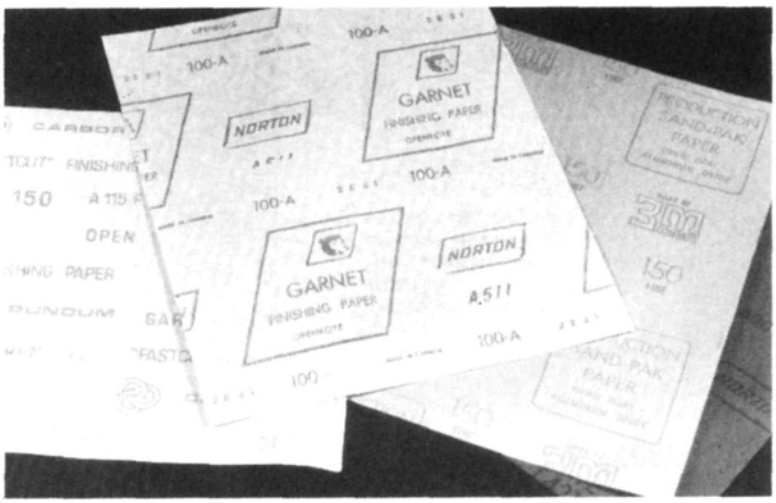
and ended with rapid acceleration into a vertical rolling climb. It was impressive and crowd pleasing, with some late arrivers asking, "When are the jets going to fly again?" All these demonstration flights, both fixed and rotary wing, are all the more impressive when you consider that they were performed in a wind that would make the average sport flier spend the day *building* rather than flying!

It was a great four days. I saw things done with R/C airplanes that I hadn't seen done before, observed some great international camaraderie, came away determined to be a better flier and probably inspired enough to design my own sport version of an Ultimate bipe. That's an awful lot of positive elements in a short time! ■

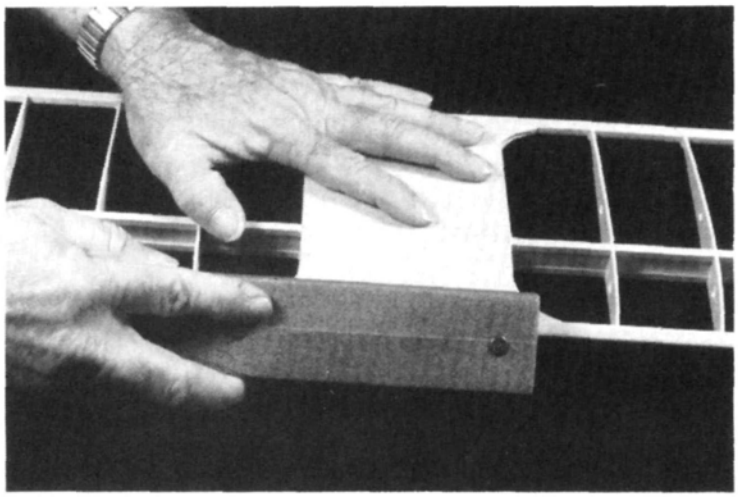
TECH TIPS

Yes, guys, sandpaper has an application on our models other than simulating wing walks. These time-proven hints will enhance your building skills.

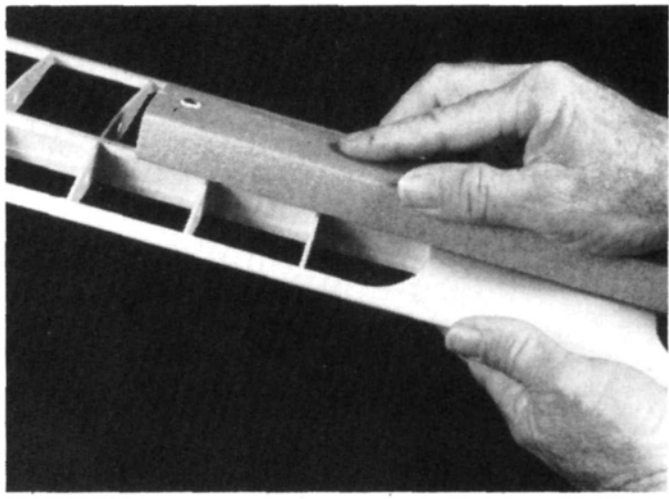
by RANDY RANDOLPH



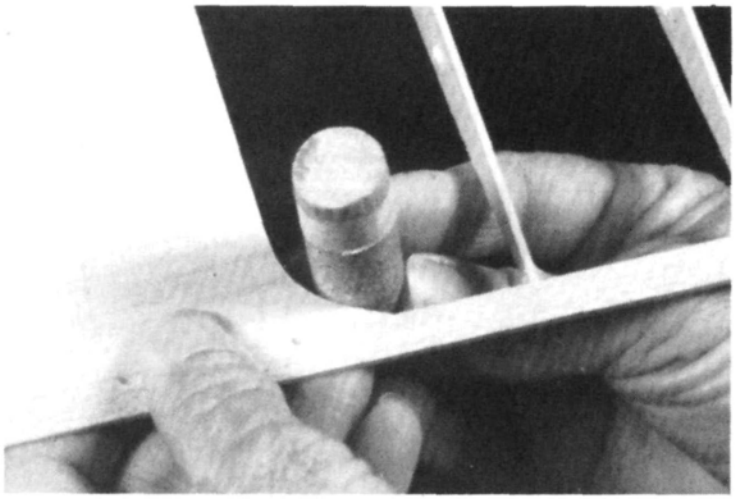
1. *The sandpapers best suited to model work are garnet and aluminum oxide types. The paper shown is an open-coat type that's less likely to clog in the sanding process.*



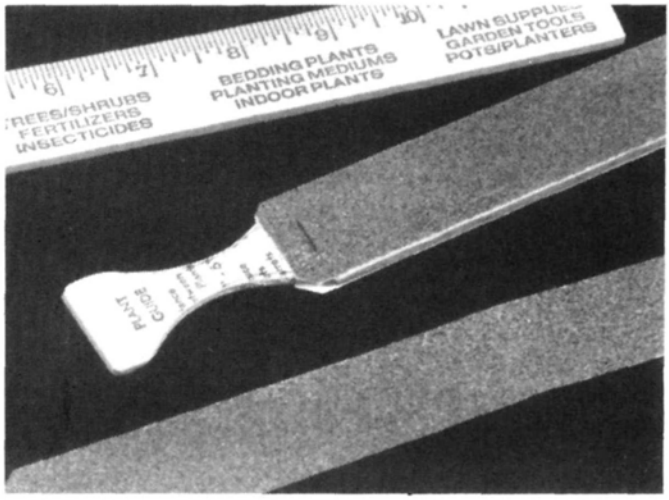
3. *The wing is held at the edge of the bench and its leading edge is sanded span-wise with 100-grit paper on a flat block until leading edge blends into ribs; smooth-sand with 150 paper.*



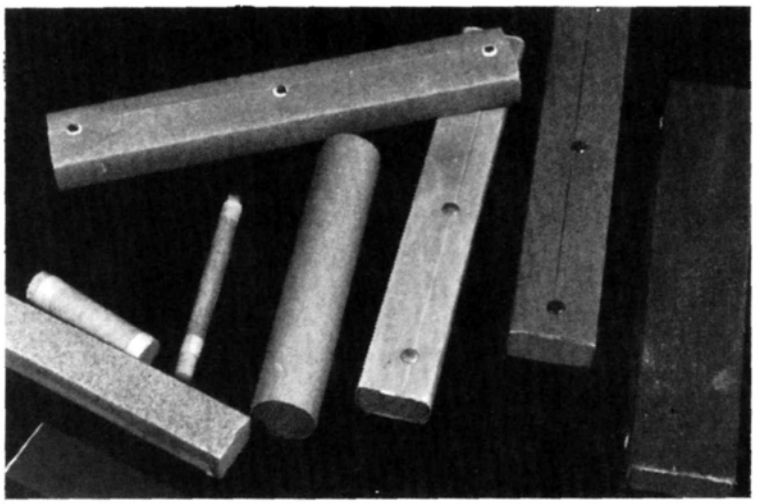
4. *Top and bottom of wing are sanded with 150 and a block. Sa chord-wise to blend spars into ribs. Tail surfaces should be sand smooth and their edges rounded.*



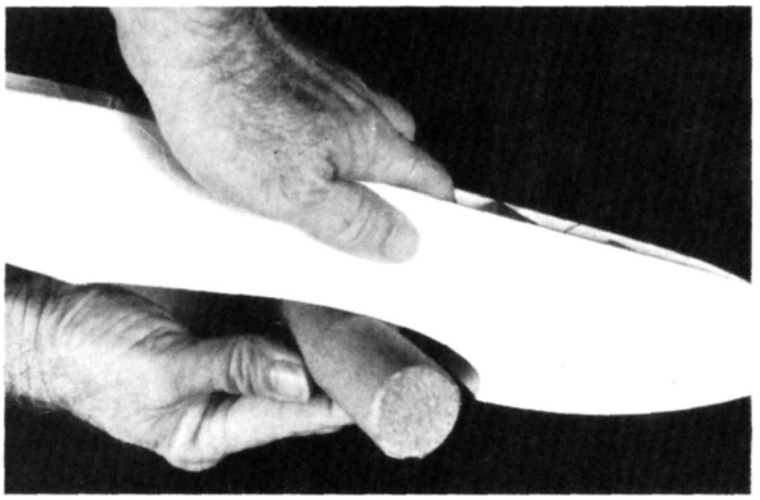
6. *Small dowels make good tools for shaping gussets. It's important in all sanding to let the paper do the cutting. Apply just enough pressure to keep paper in contact with the work.*



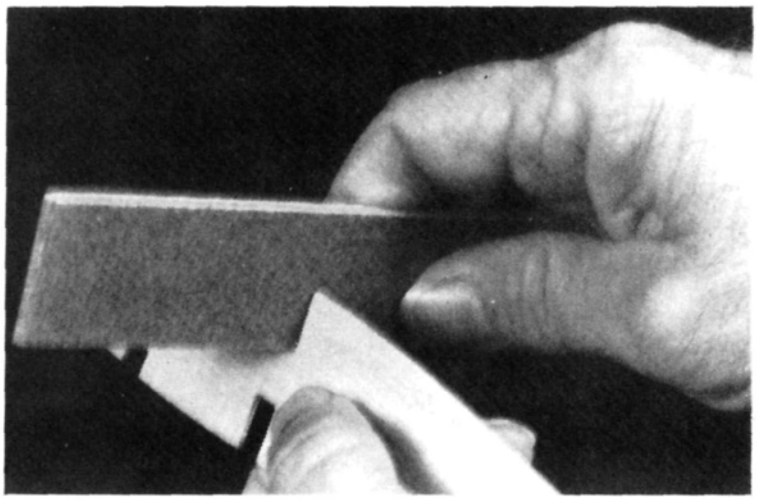
7. *Disposable wooden paint-stirring sticks, shaped as shown, with paper wrapped over the end and held in place with a staple make t handy light-duty sanding tools.*



2. *Most modeling applications require the sandpaper to be mounted on blocks. Shaping can be done with 100 grit, smoothing with 150-220 and finishing with 400-600.*



5. *On inside curved areas similar to wing cutouts, wrap 150 paper around a large dowel or broomstick to smooth or shape. Masking tape is used to hold paper to blocks.*



8. *This type of block is ideal for smoothing or enlarging notches in ribs or formers. There's no sandpaper on the edges so you won't deepen the notches.*

VIBRATION in your HELICOPTER

by Tim DiPeri

VIBRATION IS INEVITABLE when operating anything with rotating parts. Unfortunately, many helicopters are being subjected to *unnecessary* vibration. This vibration, or "shake," isn't only damaging your helicopter, but is also decreasing the reliability of your radio and increasing the chances of engine failure due to foam in the fuel tank. The problem isn't simple (there's more than one source of vibration), but it can be avoided or cured by using some simple techniques.

An Ounce of Prevention...

Vibration is frequently the result of something being bent (e.g., a shaft) and/or something being out of balance. Of course, when you construct the machine from a kit, you must assume that all the shafts are true. As far as construction is concerned, it's best to follow the manufacturer's instructions.

There are four main causes of vibration in a new (i.e., unflown) helicopter. There may be problems with:

- the main rotor and the flybar, both of which can cause a lower-frequency vibration, which is usually noticeable as a tail shake.
- the tail rotor, which can produce a medium-frequency vibration.
- the starting shaft, which is responsible for the highest-frequency vibration. This is usually noticeable as foam in your fuel tank when you operate the helicopter.

Main Rotor

Rotor blades are probably the most frequently replaced part on any helicopter. It's very important to have properly balanced blades. It's not good enough just to pivot the head from the flybar and measure an equal distance from the table to each blade tip. If this is the only means of balancing you have, make certain that the center of gravity (CG) of each blade is identical.

This balancing technique works quite well:

- Weigh each blade as it comes out of the package. Obviously, this requires a reasonably accurate scale. If the blades weigh within 7 grams of each other, they can be used, as long as you're willing to spend time lightening the heavier blade or adding weight to the lighter one. One blade may require a little light sanding to make it equal the other.
- Check the CG of each blade by adjusting the rotor blade (spanwise) on a sharp, flat edge that's perpendicular to the length and parallel to the width of the blade. The blades' CG lines should agree ± 2mm. The CG can be moved by drilling small holes at the blade tip. (Remember that the weight will also change.)

Although CG is also important chordwise, it doesn't usually present a problem, unless you're experimenting with blade pivot points and/or different weights.

- Do all sealing, adding weight (if using weight blades), and all other tasks *before* covering the blades. Be sure to keep everything symmetrical, i.e., whatever you do to one side, you must do to the other! And remember, if you've followed the first two steps, you'll have a perfect set of rotor blades.
- Repeat the first two steps. (Still perfect?)
- Finish the blades in either heat-shrink plastic or sticky-back paper. Take your time and do a good job here, because main blades, if neglected, can cause all kinds of vibration. They *must* be on the money! Weigh each blade again. If one blade is lighter than the other, add some trim tape to balance it. To avoid the possibility of it coming off in the air, make certain the tape doesn't have an edge facing the leading edge (into the airstream).
- Now place your main rotor head on a pivot point (such as a High-Point balancer) so that it pivots about the flybar. You'd expect the main rotor to be perfectly level, but it probably won't be. This is due to the linkage going to only one side of the flybar. A small strip of tracking tape on the light side may be all that's necessary to level the head.

Finally, you have a perfect set of *statically* balanced blades.

Flybar

Most helicopters today utilize a flybar for stabilization. Since the flybar rotates with the main rotor, it, too, can be responsible for main-rotor-head vibration. Follow a few simple steps; it will be time well spent in the long run.

- Disconnect all linkage that could inhibit the free teetering movement of the flybar. Be certain that the distances from the main shaft to each paddle are equal, and that the paddles are parallel to one another. The easiest way to set up the flybar is to do each task twice. For example, if you attach one paddle using 20 turns, attach the other using 20 turns, too!
- If you aren't using flybar weights, I suggest that you use wheel collars on each flybar for balancing. It's not necessary to use wheel collars if flybar weights are used, because weights alone will do the jobs of balancing and cyclic sensitivity.
- Move the collars (weights) equal distances away from the main shaft. Secure one, then adjust the other to balance the flybar parallel to the work table. Secure the second collar.
- Replace the linkages and attach the main rotors, making certain that the main-rotor pivot bolt isn't too loose or too tight. It's important that the lead/lag network works properly, or vibration might result. Tighten the pivot bolt just until the blades can no longer swing free

What to look for and how to eliminate this equipment killer

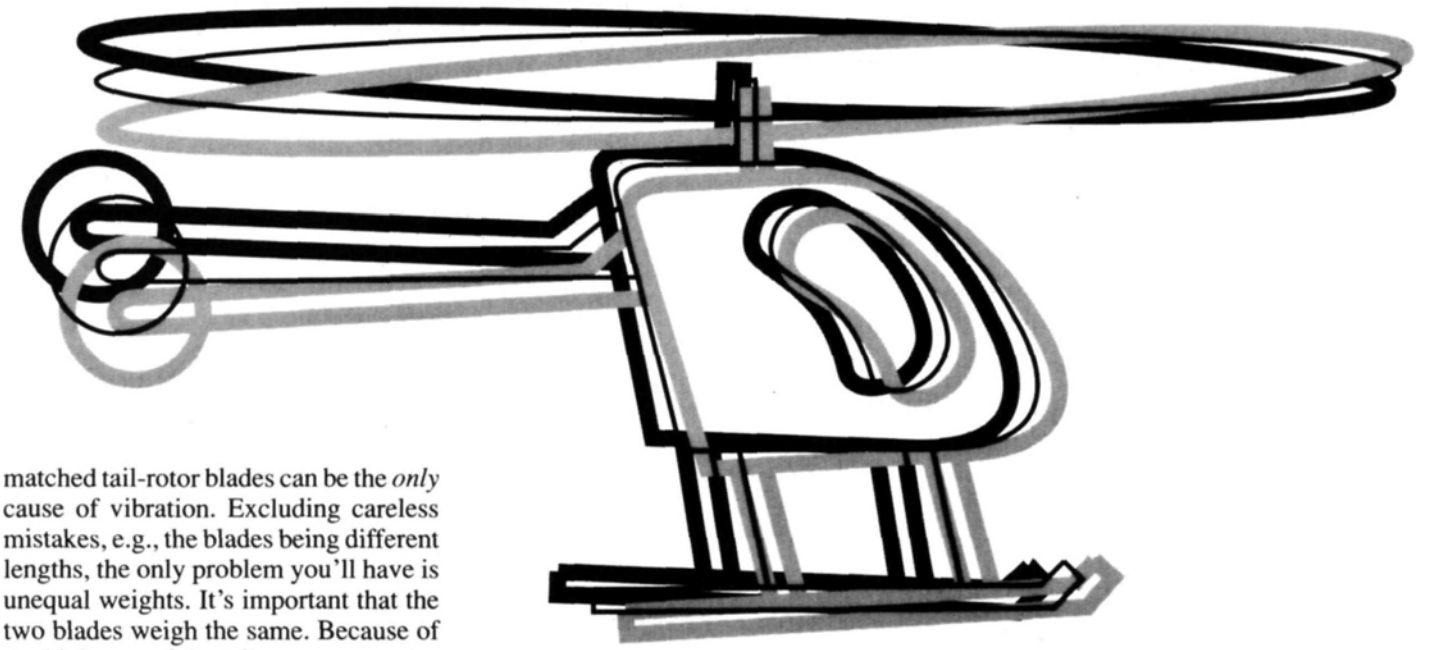
when you tilt the helicopter, and then tighten it about another quarter turn.

You should now have a perfectly balanced (statically) main rotor head.

Tail-Rotor Blades

Unless your tail-rotor shaft is bent (and, since it's new, it shouldn't be!), mismatched tail-rotor blades can be the *only* cause of vibration. Excluding careless mistakes, e.g., the blades being different lengths, the only problem you'll have is unequal weights. It's important that the two blades weigh the same. Because of the high rpm of the tail rotor, symmetry of these blades is even more critical than that of the main rotors. Fortunately, out of the package, the tail-rotor blades are usually much closer in weight than main rotor blades. As with the main rotors, a small amount of sanding is usually all that's necessary to produce a set of balanced tail blades.

After all that, finish them according to the manufacturer's instructions. As always, whatever you do to one blade, do to the other. Just to be safe, weigh each blade again to convince yourself they're the same. If they aren't, you've put too much of something on one side or not enough on the other!



Starting Shaft

Last, but not least, the most annoying, but extremely important task: straightening the starting shaft. There's really no getting away with "eyeing" this shaft, because it shouldn't be "out" more than .002 inch. If your helicopter doesn't have a top-cone starting system, the next procedure can be omitted, unless, of course, the manufacturer recommends it.

You'll need a dial indicator, a small hammer, and some method of clamping. Make sure the clutch is securely connected to the fan and/or flywheel (depending on the method used in your helicopter). Securely clamp the engine to some sort of base. On this base, secure the bottom of the dial indicator. Set the indicator so that its sensor is about 1/4 inch from the tip of the shaft. With the glow plug removed from the engine, slowly rotate the shaft to see where the high point is. Depending on how lucky you are, the starting shaft can be anywhere from .001 inch to .015 inch "off." Before adjusting, you should mark the high spot. Now temporarily reposition the dial indicator to about halfway down the shaft. Again, rotate the starting shaft and verify that the high spot is at the same point of rotation as before. If not, there are compound bends in the shaft, and it will be much more difficult to make it true. Assuming there are no compound bends, move the dial indicator back to its original position.

As the starting shaft is once again rotated, find the high spot, move the indicator sensor from the shaft, and then (using the hammer) *tap* the starting shaft forcibly toward the center. This takes a little time to master, but it doesn't usually take more then 1 hour to finish. It's extremely important that the shaft be no more than .002 inch out.

(Continued on page 62)

Basics of Radio Control

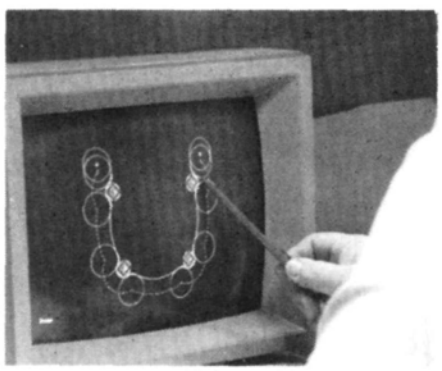
"Big Birds"

by RANDY RANDOLPH

Giant Scale Cub settles in for a landing. Big airplanes fly beautifully, and many modelers will fly nothing else.

THE DATE OF THE FIRST flight of a true gasoline-powered model airplane isn't known, but it must have taken place early in the 1920s. The engines of those days were large and heavy by current standards, and the free-flight models were also very large. Some years later, in the mid '30s, true "gas models" became practical, usually in the .60-cubic-inch range. Just before WW II, engines smaller than the .60s became popular. After WW II, when precision tooling used in war production became available for civilian use, the trend was to smaller and smaller engines. By far, the engine manufactured in the largest numbers is the .049, which numbers in the multi-millions!

Big engines and airplanes are now making a comeback. The number of excellent kits increases each year and, in many cases, the larger size of the various parts makes them less difficult to assemble than a smaller machines. The real reason for their popularity, however, is the solid performance that can be obtained with these big airplanes.



Computer-controlled machines need programs to make them work. Al Willart explains a milling-machine program that makes the outside cuts on a crankcase.

The amount of lift that a wing generates is proportional to its size, but not *directly* proportional: A scale factor is involved. For example, a small wing with an area of 2 square feet might generate 1 pound of lift under certain conditions; that would be 8 ounces per square foot. Now, a wing of 10 square feet, of similar shape and under similar conditions, might generate 10 pounds of lift, or 1 pound per square foot of area. That's twice as much (per square foot) as the smaller wing! The difference is in the amount of air that passes over the wing. Although this example is somewhat exaggerated, it shows that we can scale-down airplanes, but not air!

Small airplanes can perform very well on small engines, while larger airplanes require larger, more powerful engines. Even though more lift is provided by the larger wing, the increased *drag* of that wing requires additional power to pull it through the air.

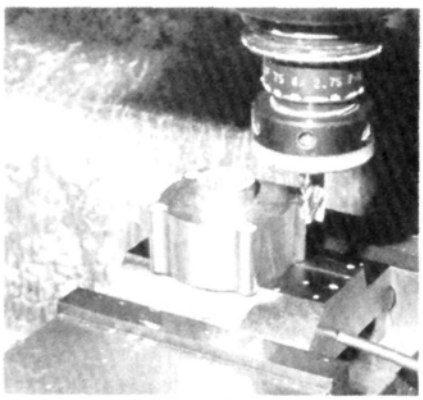
Another thing large airplanes have going for them is that they appear to fly more slowly than smaller airplanes. *Appear* is the key word: If an airplane is 2 feet long and is flying at 30mph, it will take approximately .06 second for all of it to pass a given point. A 4-foot-long airplane will take .12 second to fly past that point at the same speed. Since vision is centered on the whole airplane, the larger airplane seems to fly past more slowly. Now, move the larger airplane away until it appears to be the same size as the smaller airplane and it *really* seems to slow down!

This apparent speed differential, and the fact that the larger machine has more inertia to overcome when control commands are given, contribute to the grace of its flight. I'm not saying that they're easier to fly than their smaller brothers, but these characteristics do tend to lengthen the response time required to

(Continued on page 44)

change flight attitudes.

An additional factor to consider when discussing the larger airplanes: They're less responsive to variations in the air. Wind gusts, updrafts and downdrafts cause less disturbance to their flight path because of inertia. This is no small asset if your flying area is regularly subjected to turbulent conditions.

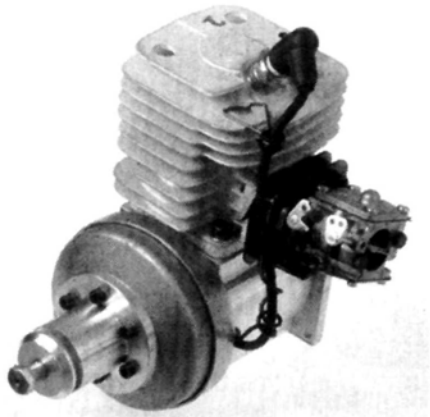


A finished crankcase that results from the program in Picture No. 2. These machines can hold tolerances of .0001 inch with ease and, if necessary, .00005!

We tend to think that smaller engines require much more precision in their manufacture than larger engines. This is *not* the case, however, and a trip through a plant that produces "giant-scale" engines might offer some insight into the efforts needed to produce efficient engines at a reasonable cost.

In its Texas plant, A&M Aircraft Inc.* uses only CNC (Computer Numeric Control) machine tools to produce the parts for the large engines it manufactures. With the exception of cylinder and piston assemblies, which are produced elsewhere, all parts are machined in this plant by fully computerized tools that can hold a tolerance of .00005 inch. This kind of precision ensures the proper fit of all parts in the finished product. Proper fit is the secret to good performance and long life in any engine, and this is particularly true of those made for ¼-scalers.

Although transmitters and receivers are the same for every airplane size, the servos and associated hardware in large airplanes are subject to more flight loads than those in the smaller birds. Big airplanes need big, powerful servos like the Futaba FPS134, or redundant servos (two on the same surface) and larger battery packs. Clevises, ball links and rod ends should be of the 4-40 threaded variety, and control horns and bellcranks should also be heavy-duty types. Pushrods should be replaced with control cables in a pull-pull arrangement with double control horns. In short, large airplanes follow full-scale practices more closely than other types of models.



Big airplanes need big engines. This 4.6 cubic-inch-job is by A&M Aircraft Inc.

Quarter- or giant-scale planes aren't for everyone. Expense and transportation problems are important considerations, as is the space necessary for construction and storage. But if you're willing to make the effort and incur added expense, there are definite rewards in performance. These airplanes aren't considered to be trainers, because learning to fly usually involves several hard landings and other collisions with the ground that can necessitate rather extensive repairs. Learn to fly on the little ones first!

**Here's the address of the manufacturer mentioned in this article:*

A&M Aircraft, Inc., 1428 McArthur, Carrollton, TX 75007. ■

J-3 CUB

(Continued from page 26)

hinges with wooden toothpicks after the epoxy sets. I drill a 1/16-inch-hole through each side of the hinge, about 1/4 inch from the hinge line and epoxy the toothpicks into place. When it's dry, I cut off both ends and sand them flush. If you like, use a hole punch to make small circles from the spare covering material provided and cover the toothpick ends for a very clean installation. The same procedure is repeated on the wings.

The tail-wheel bracket is then added, using two screws to fasten it to the tail post, and the tail wheel is mounted with the two wheel collars provided. The tail-wheel tiller bar is fastened to the rudder with the U-bracket provided.

The main gear is assembled next; I painted the pre-assembled wire gear with black epoxy paint after sanding it thoroughly. The landing-gear covers are epoxied into place, and the gear is held in two fuselage grooves by four small U-brackets and eight wood screws. The two 2½-inch-diameter-wheels are held onto the landing gear by means of the four wheel collars provided

The wing halves were assembled next. First, the plywood dihedral brace was epoxied into the right wing half and allowed to dry. Make sure no epoxy build-up is present at the wing-root dihedral brace joint. Next, mix enough epoxy to coat both wing roots, smear the epoxy into the left wing dihedral brace slot, then coat the face of both wing roots and press the wing halves together, making sure that the two halves are aligned at the leading and trailing edges. With alcohol, clean off any excess epoxy at the joint, then tape the joint with masking tape and stand the wing vertically until it's dry.

The wing is now fitted to the fuselage for hold-down. Place the fuselage on a flat surface, then locate the wing so that the dihedral joint is in the center of it. Hold or tape the wing to the fuselage while you spot three holes using a 1/8-inch drill bit. First, spot the leading-edge dowel hole through the fuselage into the leading edge of the wing, then spot the two rear-wing hold-down holes through the wing blocks and into the fuselage blocks. Make sure that the wing doesn't move during this procedure. The three pilot holes can then be opened for the front wing dowel and the two rear hold-down bolts and blind nuts.

Adding the windshields for the sides and front completes the fuselage. I held

(Continued on page 56)

Field & Bench Review

CULPEPPER MODELS

CHUPEROSA

by PETE YOUNG

PHOTOS BY PETE YOUNG

FROM CULPEPPER MODELS*, the Chuperosa is a 59.7-inch-span (1.5 meters) R/C glider that was designed for hand-launching, winch-launching, or slope flying. This little "hummingbird" can be ordered with either an Eppler 214 or a Selig 4061 foam wing, directly from the manufacturer. The builder has a choice of a polyhedral (rudder and elevator control) or vee-dihedral (coupled aileron/rudder, elevator) configuration.

A 1½-meter glider that offers the builder a variety of wing options, from airfoil to wing configuration

For this review, I chose to build the Chuperosa with the Eppler 214 airfoil in the vee-dihedral version. In this configuration, the ailerons are actuated by metal cable-rods that run through the wing to a servo mounted in the forward fuselage. This servo is mechanically coupled to the rudder linkage, thus providing coupled aileron/rudder with only one servo. The all-flying stabilator is actuated by its own servo and metal cable-rod linkage. Hmmm...control of *three* surfaces by only *two* servos—ingenious and light.

The Chuperosa's design features include a 1/32-inch balsa-sheeted foam wing and a fuselage structure utilizing a built-up truss aft section. The foam wing cores are cut from 1-pound-per-cubic-foot white Styrofoam with 2 degrees of washout. Extremely light 1/32-inch balsa stock is supplied for the wing sheeting, along with an unusually complete set of accessories. These include the metal cable-rod linkages, ball-links, solder sleeves,

Our reviewer, Pete Young, appears to be serious during the first flight launch of the Chuperosa. He must have smiled later, as he was happy with the flying qualities.

Type: *Multi-purpose, 1 1/2-meter glider*
Span: *59.7 inches*
Weight: *15 1/2 ounces*
Wing Loading: *5.4 ounces per square foot*
Radio Channels Required: *2 or 3, "mini" or "micro" size*
Suggested Retail Price: *with aileron wing, $46; with polyhedral wing, $41.*
Features: *Foam wing cores with choice of airfoil and dihedral configuration. Photo-illustrated construction manual and full-size plans.*
Comments: *An excellent-handling, high-performance glider that"s equally at home hand-launched or on the winch. Good example of "cottage industry" product.*

a small tow hook, No. 8-32 nylon wing bolts, a pre-threaded maple wing-mounting block and numerous small ply pieces for the fuselage and wing. Clearly, a lot of "cottage industry" TLC has gone into the kitting of the Chuperosa—effort that probably wouldn't be cost-effective for a commercial kit manufacturer.

The Chuperosa is a fairly small airplane that requires careful construction and attention to detail to produce a well-engineered and lightweight airframe. Although the foam-covered wing may seem to be an extra complication, it provides a much stronger, truer wing than if it were a built-up structure, and the finished airframe weight should be comparable.

CONSTRUCTION: When building the Chupersosa, I followed the two-page, single-spaced set of instructions supplied with the initial production run. These instructions have since been superseded by an eight-page illustrated manual, which contains black-and-white photographs of the major construction steps.

Although the written instructions are very clear and comprehensive, the 25x73-inch plans sheet should be reviewed carefully before you start construction, as it contains a lot of important details for both the polyhedral and the vee-dihedral configurations.

No significant problems were encountered during construction, but I'll give you some helpful hints here, along the lines of "lessons learned."

The 1/32-inch sheeting is excellent 4- to 6-pound-density wood. As it dents quite easily, your work surface should be cleaned carefully to pick up glue blobs, or any hard pieces that could damage the wood. To avoid tearing the wood, it's best to use a new razor blade when cutting this thin sheet stock.

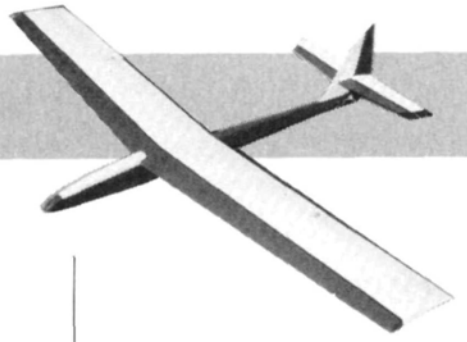
Of the several techniques available to attach the wing sheeting to the cores, we chose to use Pettit* Hobbypoxy II slow-curing epoxy, slightly thinned with isopropyl alcohol. The epoxy approach was chosen because it gave a little more working time than contact cement or transfer tape. To avoid excessive weight build-up, most of the epoxy should be removed from the balsa sheeting before it's attached to the cores.

When routing the elevator and rudder linkages through the fuselage, it's important that the rudder linkage runs along the left side of the fuselage, and the elevator linkage down the right side. This is particularly important in the vee-dihedral version to provide the proper hook-up to the servos.

Finally, the wing should be keyed to the fuselage, and this was best done by measuring a small piece of 1/16-inch balsa to fit between the fuselage sides, and then attaching it to the undersurface of the wing.

Since the Chuperosa's structure doesn't rely on the covering for stiffness, almost any modern covering will suffice. Coverite's* "Black Baron" was chosen for its lightness and ease of application. Final results, especially over the sheeted wings, were very pleasing, and it didn't

(Continued on page 51)



"...it's a pleasure to fly it from a winch or a hand-launch."

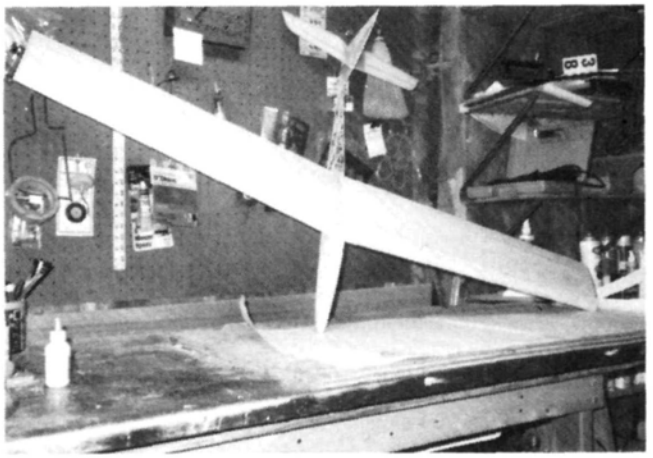
"bubble" when it was applied.

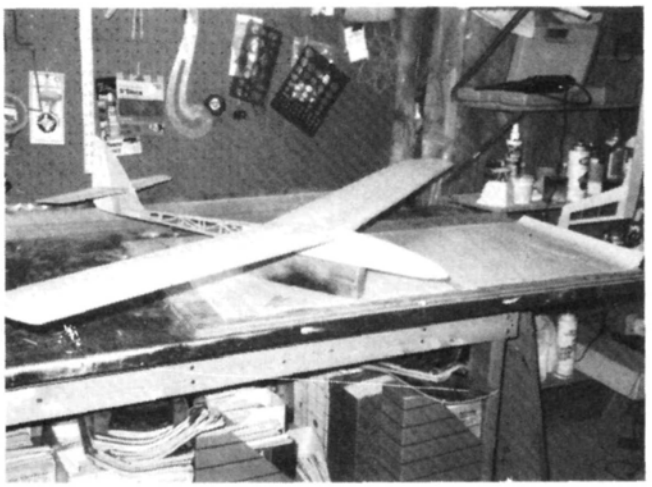
Due to the smallness of its fuselage, the Chuperosa required smaller radio equipment in the "mini" or "micro" category. The glider was fitted with two Futaba* S-33 servos, an R-4H micro-receiver, and a 250mAh battery pack. Ballasted and ready to fly, the Chuperosa weighs about 15½ ounces. This computes to a wing loading of approximately 5.4 inches per square foot, which is an excellent figure for this class of aircraft.

PERFORMANCE: Initial hand-glides showed the Chuperosa to be nimble and responsive, requiring only a light touch on the controls. A small high start was used to gain some altitude for fine-tuning the glide trim. First, the Chuperosa's elevator trim was adjusted for "hands-off" stable flight; then the aircraft was put into a 45-degree drive, the controls were released to neutral, and the model's pitch response was closely watched. A quick pitch-down indicates a tail-heavy condition; a rapid pitch-up indicates a nose-heavy condition. What's required is a slight pitch-up after traveling several fuselage lengths along the flight path.

Just a slight amount of nose weight was needed to obtain the desired flight behavior. It's important to work through this fine-tuning before attempting hard hand-launches, so that the model won't pitch excessively (upwards or downwards) when thrown at high speed.

The flight tests have shown that the Chuperosa handles extremely well and that it's a pleasure to fly it from either a winch or a hand-launch. Coupled to its low-drag airframe, its Eppler 214 airfoil gives an excellent gliding performance. In particular, our "straight-wing" aileron/rudder/elevator version flies beautifully, and I'm waiting for a chance to fly it against a rudder/elevator version being built by another glider-guider in the same club.





The completed Chuperosa awaiting "clothing." The foam core wing is completely sheeted, the open truss structure of the fuselage aft section is unusual but well thought-out.

SUMMARY: For those who want high performance in a compact package, the Chuperosa offers a lot of design features in a moderately priced and versatile product. Whether your choice is vee-dihedral or polyhedral, Eppler 214 or Selig 4061 airfoil, the Chuperosa is an excellent design, and its kit engineering is second-to-none. Build one and fly one silently!

**Here are the addresses of the companies mentioned in this article:*

Culpepper Models, Inc., 2526 Washington, Dubuque, IA 52001.

Pettit Paint Co., Inc., 36 Pine Street, Rockway, NJ 07866.

Coverite, 420 Babylon Road, Horsham, PA 19044.

Futaba Corporation of America, 555 West Victoria Street, Compton, CA 90220. ■

Giant Steps

by DICK PHILLIPS

This 12-inch-to-1-foot Curtiss R3C-3 racer is typical of the type of seaplane that will be modeled for competition in the upcoming giant-scale Schneider Cup race.

MOST SCALE MODELERS make history on a smaller scale; this is particularly true of those who model antique and classic airplanes, as many of their models depict airplanes that no longer exist.

One of the most interesting events to come to my attention recently is the Giant Scale Seaplane Classic Race to be held on November 10, 11 and 12, 1989, at Lake Havasu City, AZ. True, it's months away, but now's the time to get started on your entry. I think this race has a good chance of becoming a regular event; the coordinator tells me that the local community is 100 percent behind it and offer participants every convenience. If you've been paying attention over the years, you'll know that this is the community that once received international attention when London Bridge was taken apart, transported to Arizona and reassembled there.

Basically, a re-enactment of the Classic Schneider Cup races of the early 1930s is planned. The Cup was offered for speed in racing seaplanes and was won permanently by Great Britain in September '31 with the Supermarine S6B. This sleek, attractive airplane was the forerunner of the Spitfire, and much of the success of this classic WW II fighter was based on lessons learned during testing and flying of the S6B. It established a world speed record of 406.997mph in September 1931.

The Race Classic held at Lake Havasu will duplicate the Schneider Cup races of that golden age. Models must be of the airplanes that took part in the original races. The Curtiss R3-C comes to mind, as does the S6B, among others. Competition was international at the time, so there are a number of airplanes that qualify. (I think Jimmy Doolittle flew an R3-C in the Schneider.)

There are other details about what qualifies, of course. For example, biplanes must be 1/3 scale and monoplanes

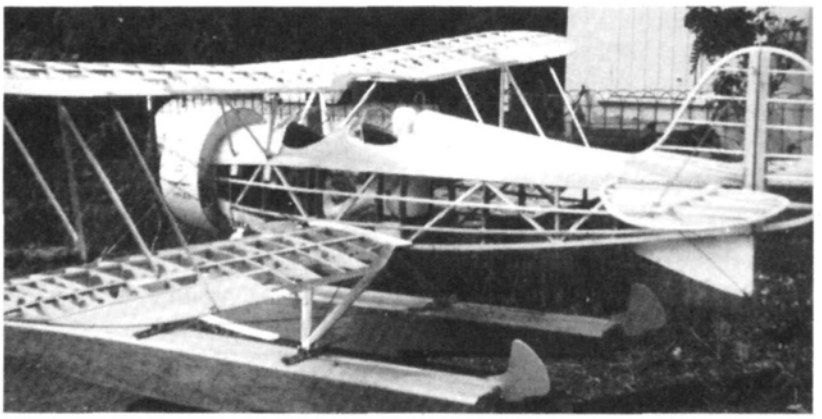
must have a span of 100 inches (plus or minus 10 percent). At Las Vegas in October '88, I saw a very large R3-C that was being built for the races, and there are many other airplanes under construction around the country.

Electric, diesel and 4-stroke engines are also permitted, so there's a spot somewhere for almost any builder and almost any type of model that qualifies as having once been proposed as a Schneider Cup racer.

Scoring will be according to several criteria: static judging under AMA Sport Scale Rules; flight realism, especially of water handling; and finally, the relationship of scale speed to that of the original airplane. Each of these will count for one third of the final score. (Seems to be a good system.) Airplanes that wouldn't have competed against one another at the original races don't have to do so at the model event. As long as they fly at a speed that's comparable to that of the original, they'll score well, regardless of what that speed might be. In other words, an earlier (and probably slower) biplane doesn't have to fly head-to-head with an S6B to do well. If it flies at a speed that's proportional to that of the original, looks like the original, and handles well on the water, it could easily be a winner. Water rudders may be used on the models, even if they weren't used on the original, and no scoring penalty will be imposed. Likewise, having visible mufflers won't lead to a deduction of points. "Builder of the Model" rule won't apply.

To date, over 35 modelers have said they're building models with which to compete in the '89 event. People in eleven states and Canada are among those already building, and there has been some interest shown by modelers in Europe, too. (This isn't surprising, as the original event was held in a number of locations there.)

The availability of plans is also on the rise. Jim Pepino of Scale Plans and Photo Service* now has a Supermarine plan available, and Don Smith has a plan ready for an 88-inch-span Curtiss racer. (Both of these plans qualify, of course.) There's also a set of glass floats for the Supermarine now being developed.



Waco UBF by Dick Hershey of Lakeport, CA. Note sub-rudder under fuselage and raised water rudders at rear of floats.

Bob Martin* publishes a newsletter about the event, and the issue I have gives sources of documentation for airplanes that took part in the original event; he'll undoubtedly publish more information as it becomes available. If you'd like to know more, contact Bob, and ask him to put you on the mailing list for the "Race Newsletter." In addition, I'll keep in touch with him and will pass along any news as we get closer to the event. In the meantime, if any of you are planning to race seaplanes, drop me a line, send me photos of your entry, and I'll try to keep in touch with your achievements. I'll track developments and pass them along to you.

Speaking of aviation history, old friend and master builder Dick Hershey is at his workbench again. In California, Dick is a member of a rather loosely knit group known as the Clearlake Renegades. (They've been mentioned here before, and I'm sure that their activities will appear again.) Dick's current project is from a plan he drew up for Mike Smith, who bought his Grumman Goose some time ago. The plan is for a ½-scale Waco UBF, and Dick's proof model is ¼ scale, or half the size of Mike Smith's biggie. As shown in the photo, the model weighs 35 pounds, spans 90 inches and is powered by a Zenoah 38. It's a model of the Waco that was used in the movie, "Raiders of the Lost Ark." As is obvious from the photograph, Dick's a real craftsman and builds models that anyone would be proud to own.

In the letter that accompanied the picture, Dick mentioned that the Goose had been rebuilt by Mike Smith. Regular readers will recall that the model was damaged on its maiden flight and Dick then passed it along to Mike. The rebuild has been completed, and the reincarnated Goose has been flown. It has already been looped, which is certainly not prototypical performance for a Goose. Good to hear that such a spectacular model has been put back in flight, rather than being allowed to sit in the back of someone's shop and decay.

**Here are the addresses pertinent to this article:*

Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403.

Bob Martin, 1520 C. Acoma Lane, Lake Havasu City, AZ 86403. (602) 855-6900. ■

J-3 CUB

(Continued from page 46)

the side windows in place with CA and the windshield with epoxy. When dry, the windshield edge may be trimmed with spare yellow covering material provided. The engine is then mounted; I used an Aristo Blue Bird 25 and elected to mount the engine upright so that the cowl wouldn't be weakened structurally by the removal of a lot of material. Four holes were drilled to mount the engine using 8-32 cap screws and blind nuts. The cowl is held in place with wood screws that were screwed into hardwood blocks mounted to the fire wall. The cowl mounting blocks were trimmed to fit the contour of the cowl. The 6-ounce fuel gas tank provided is then assembled and installed.

The radio installation is the next step, and I chose the Aristo Hi-Tech Challenger 720 for the flying evaluation. The installation was pretty much standard, but I had to buy a fourth servo, as the 720 only comes with three. The servo tray was pre-cut, so it was only a matter of opening up the servo holes with a file to accept the 720 servos. The aileron servo tray had to be assembled from the die-cut plywood pieces provided then epoxied into the pre-cut wing well. All pushrod materials are provided in the kit and are assembled using dowels, shrink tubing and the end fittings. (Of course, this will vary, depending on the radio you're using.) The aileron servo just uses metal pushrods and clevises because of the short run. Next, the struts were assembled and installed and, finally, the decals were affixed to the fuselage and vertical fin.

The instructions indicated that the CG was 3½ to 4 inches behind the leading edge, but even with the receiver and battery pack as far forward as I could get them, the model was still tail-heavy, so I mounted 4 ounces of lead to the fire wall to get proper trim. The all-up weight of the completed Cub was 4 pounds. With the engine broken-in and performing well, off I went to the flying field.

PERFORMANCE: Before flying, I checked the range of the system to 400 feet with the transmitter antenna collapsed, which was satisfactory. The starting surface throws were: aileron +/- 5/16 inch, rudder +/- ¾ inch and elevator +/-⅜ inch.

Flying turned out to be quite a challenge. Initially, I had too much aileron throw and the Cub was extremely sensitive. It snap-rolled on the first flight at approximately 40 feet—fortunately, into high grass. I returned home and reduced the aileron throw, checked wing for wash-in and washout—it was OK. I also decided to add more area to the stabilizer and vertical fin, as they're quite small compared to the wing. Rudder and elevator were OK area-wise. To obtain more tail area, I cemented a ¼x½-inch balsa strip to the leading edges of the stab and fin. In order to do this, about ½ inch of the leading-edge coat has to be cut away and the balsa strip sanded with a ¼-inch round file to contour the strip to the existing rounded leading edge. Both stab and vertical fin strips were contoured to blend in with the tip shape. The leading edges were then re-covered with yellow sticky MonoKote. The next flight was more successful, but still a bit on the squirrelly side.

Despite it's trainer appearance, the Aristo-Craft Cub is *not* a beginner's model. It takes quick hands to fly it and great patience to get a good takeoff. Even with the modifications I described, it's a handful. I also think the Cub would fly better with a larger engine, e.g., a 35, which would also help the CG problem. I've communicated my comments to

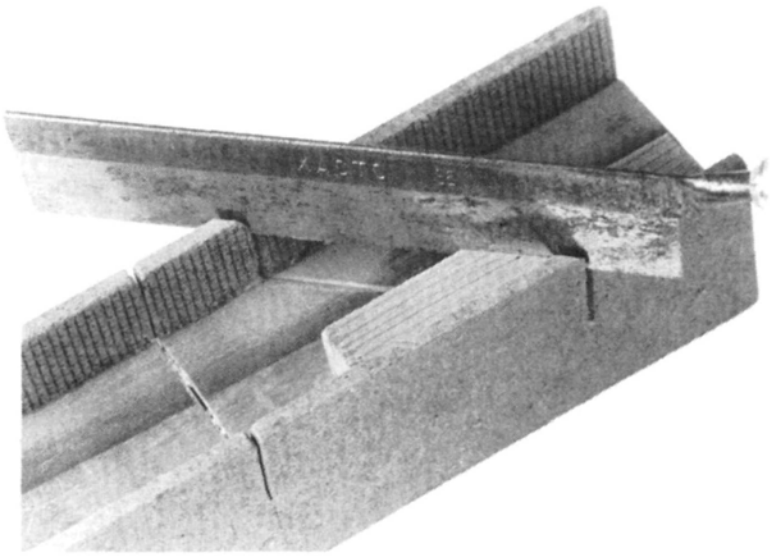
(Continued on page 62)

How To:

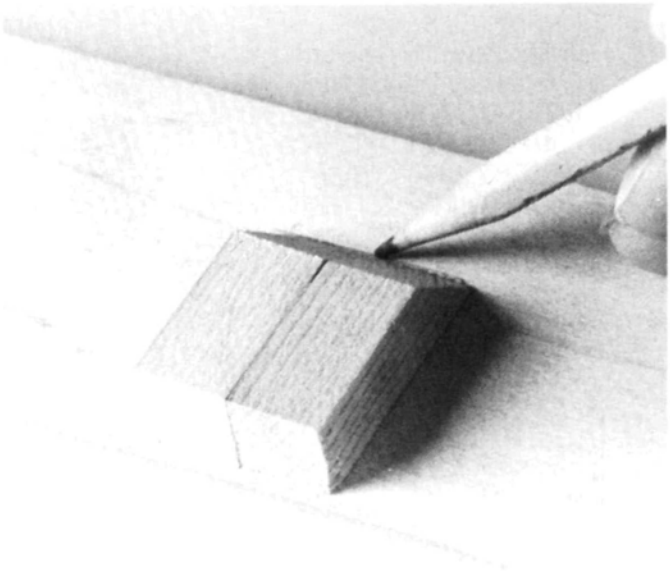
by RANDY RANDOLPH

MAKE A BALSA TRIANGLE STRIPPER

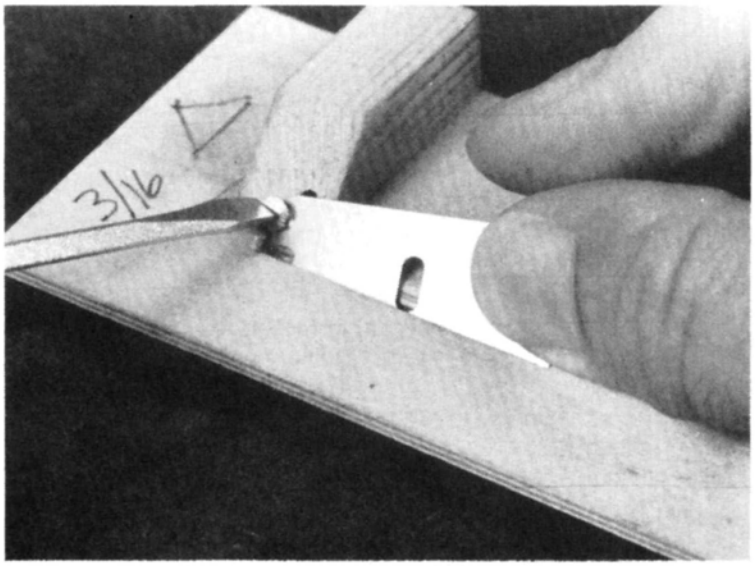
A simple method of producing those handy pieces of balsa reinforcing material to your size requirements. They provide the same bonding area as square stock at half the weight.



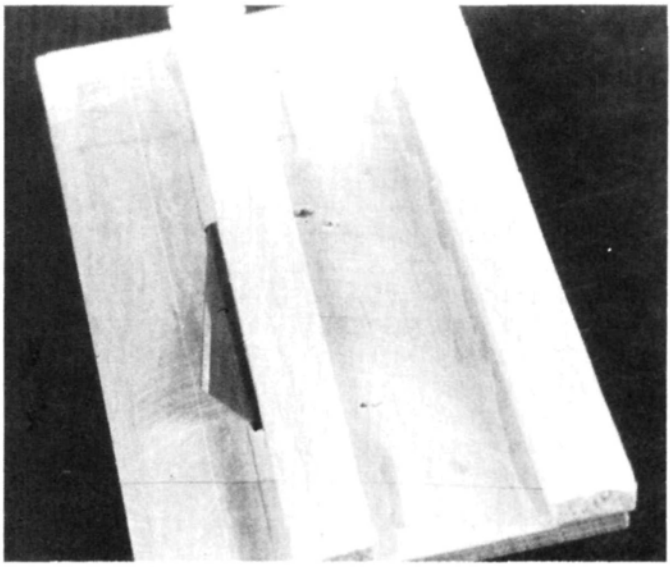
2. Use the razor saw and miter box to cut the ½-inch hardwood block into two pieces, each with a 45-degree angle on one end. Trim the square ends of the blocks so that they're the same size and about 1½ inches long.



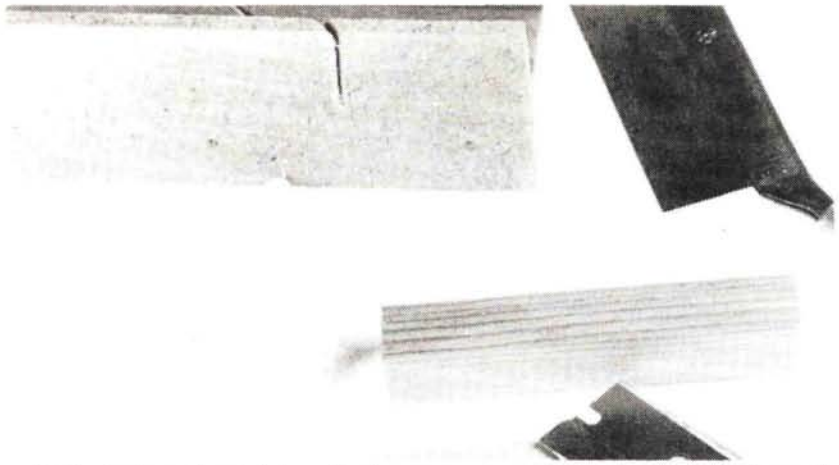
3. Cut a piece of ⅛-inch plywood about 3 inches wide and 5 inches long. Position the hardwood blocks on the plywood as shown, and use a pencil or pen to mark the edges of the 45-degree ends.



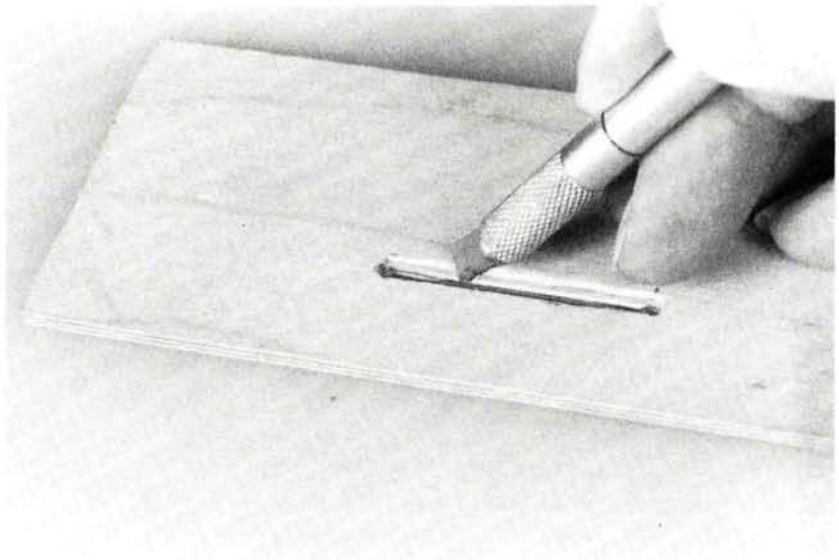
5. Remove the backing from the razor blade and position it, at the angle shown, on the hardwood blocks. Secure it with ¼-inch, No. 4 wood screws. The bottom tip of the blade should project the same distance below the plywood as the thickness of the stock to be stripped (in this case, 3/16 inch). Remember, the blade is on a 45-degree angle, so measure the actual distance from the plywood to the tip.



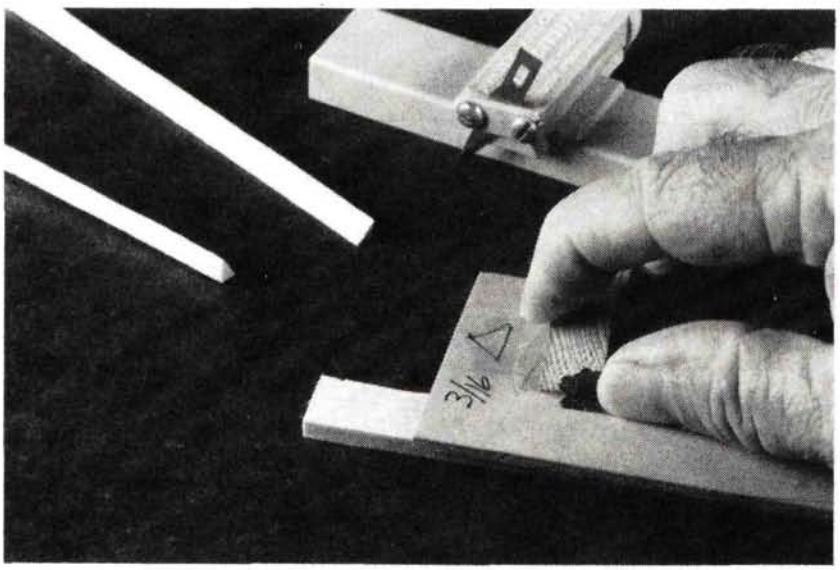
6. Glue guides to the bottom of the ply base. These guides should be the same thickness as the stock to be stripped. Position one just touching the base of the blade, and parallel to it, and the other, on the edge of the ply, away from the blade.



1. The tools and material required: a razor saw and miter box; ⅛-inch plywood; ½-inch-square hardwood about 4 inches long; a single-edge razor blade and a scrap of balsa the same thickness as the stock to be stripped.



4. At the location marked, cut a slot the same length as the width of the single-edge razor blade. Use a razor knife and make repeated strokes to slice through the plywood. Glue the hardwood blocks into place and try to angle the slot to correspond to the angle of the blocks.



7. Just like any stripper, use by holding the guide against the edge of the stock and stripping. When the first triangle strip has been cut, use a conventional stripper to cut the next; then, just alternate strippers after each cut.

Floating Around

by JOHN SULLIVAN

Bill Curry's Sig Cub on Sullivan floats. Cub yellow, Lotus green and white scheme makes for a striking model.

MY LEAD PHOTOS this month feature Balsa USA's* new Easy 100 Trainer on floats. Every plane has a story behind it, but this one had a few under its belt before we even put it on the water. It started when I flew back to my hometown of Menominee, MI, for my folks' 50th wedding anniversary. I hadn't been home for 12 years, and one of the first people I looked up was Ronnie Bush, a high school buddy and founder/owner of Balsa USA. As it happened, I couldn't see Ronnie right away because he was under intensive care after touring with the Kingston Trio for a week, but his General Manager, Jim Kudlicki, was kind enough to show me around the factory.

Ronnie started in the model business years ago when he bought Paul Joy's Joy Manufacturing Company. Some of you might remember Joy's little .049 Balsa Control Line kits from the mid '50s. Things have changed. Jim Kudlicki showed me around a facility made of 10 Butler buildings, each having a separate purpose. It was like walking through a modeler's workshop gone wild! One building for wood storage, one for sheets, one for ribs and die-cutting, one for shipping, and the list goes on. The production is huge, too. They have three setups, each capable of sawing and sanding 2,000 sheets of balsa a day. On my first day there, they were collating 180 kits at one time, and that kind of production goes on constantly!

The Easy 100 on fly-by.

A couple of days later, Ronnie was able to take sunlight again and I went back to the plant for another tour. On a serious note, I think my one lasting impression of the place will be of the genius involved in the machines Ronnie has designed to produce his kits. These things can literally *squirt* parts out at the end, and that's the reason he can offer a high-quality kit at such a reasonable price.

On the way out on my final visit, I spotted one of the new Easy 100 Trainers designed by Laddie Mikulasko. I told Ronnie that it might make a good floatplane, and left it at that. We spent the rest of our visit discussing his old tube-receivered R/C planes, high school escapades, and the time we kicked in the dash on his '49 Buick convertible because the radio wouldn't play.

On my return to California, I found an Easy 100 kit on my front porch. I called Mike Johnson and we made a deal whereby he'd build the plane, I'd build the floats, he'd get to keep the plane, but I'd have flying privileges. The Easy 100 has

Don Deyell's Pilot Super Cub on scratch-built Edo floats. Flies very realistically with an O.S. 61 4-stroke. (McLeod photo.)

sheet-balsa fuselage and empennage construction with a built-up D-Tube wing. The ailerons are strip-type and Balsa USA provides a strong ABS cowl. The plane's nice racy look belies its trainer capabilities.

The Easy 100 builds fast. Mike built the plane in my shop, and we had every intention of taking progress shots, but the Easy 100 just kept growing and we never stopped for photos. I think Mike had it ready to cover in 30 hours, and that included moving the fire wall back to take a 4-stroke O.S.* 60 and putting 1/8-inch stiffeners in the fuselage to provide four hard points for the float installation. The plans were really good, the instructions brief but adequate, and the photos supplied showed you what it should look like. Those who have built a few kits could assemble this one in their sleep. A first-time modeler

Diane makes stick and aileron stock. (Grading tables in background.)

would have a little more trouble with it than, say, a Goldberg Eaglet because of the D-tube sheeting and cap strips, but it's really not a big deal to follow the instructions.

Mike is one of the best free-style pilots in our club. He knew he'd modify the Easy 100 sooner or later to "go where no one has gone before" and he opted for *sooner*. However, the only two changes he made *before* the first flight were to reduce the dihedral by half, and to upgrade the float length from the recommended 32 inches to 36 inches. The 32-inch float will easily support the Easy 100, but we opted for the longer float to give the plane a slightly

The sheet-cutting department. Well-lit, well-ventilated facility is capable of very high production runs.

larger "footprint" for crosswind taxiing plus prop-disc-to-bow extension to reduce the risk of tipping forward on takeoff.

I borrowed George Graff's idea for glassed foam floats, and I'd like to pass it on. George sprayed a light coat of Touch 'N' Stick spray adhesive over his entire foam-float core and then rolled on and pressed out 6-ounce fiberglass cloth. This particular adhesive is compatible with epoxy resins as are, I believe, 3M "77" and Loctite* adhesives. The resulting wrapped, foam core can then be hung up by a string and all surfaces can be epoxied in one operation. You still have to "squee-

Mike Johnson runs up the Easy 100's O.S. 60 4-stroke, while his parents, Joan and Tom, watch.

gee" off all the excess resin, and this means putting your fingers on the wet float to hold it stable, but on the plus side, the epoxy won't tack to your fingers or allow the cloth to rise where you touch it. I bet George's process halves the time required to glass a pair of floats.

With the floats glassed and the fuselage ready for covering on my workbench, Mike aligned and locked up all the parts, made some quick measurements, and bent a wire landing-gear set for the Easy 100. At this point, we learned Mike's parents, Joan and Tom Johnson, were coming out from Indiana for a visit. Mike and I had interested Mike's dad in R/C float flying a couple of years ago, so, seeing the opportunity for a third reunion-type incident connected with the Easy 100, Mike hurried to finish the plane before his parents' arrival.

With the exception of not having enough time to paint and install the cowl, everything worked out well, including the weather. With an O.S. 60 4-stroke for power, the Easy 100 took off with one of the most rock-solid climb-outs ever seen. There are other trainers, like the Craft-Air Butterfly or Sig's Seniorita, that fly more slowly, but I really think the Easy 100 can be a great first airplane, especially on floats with a *big* lake to come down on. The nice thing about the Easy is that you can stay with it and easily progress to loops, rolls, eights, etc. Even with reduced dihedral, with just aileron and slight elevator, the 100 turns flat with very little altitude loss.

Mike has found that the rudder will stall and become ineffective if you increase the throw. The rudder action is just fine for a trainer, as are the big, slow, aerial-ballet-type maneuvers you'd expect. As an experiment, Mike has doubled the rudder area, added a 20-percent sub-rudder, and moved up to an O.S. 90 4-stroke in an attempt to get the plane to perform inside and outside snaps. It *hasn't* worked. It's almost as if Mikulasko is saying, "This is a trainer, and it's going to *stay* a trainer!" OK, Laddie, we give up!

Splash Bash

Elsewhere this month, you'll find photos from Alex McLeod, which were taken at the second annual "Splash Bash" sponsored by the Peterborough R/C Club up in

(Continued on page 103)

J-3 CUB

(Continued from page 56)

Polk's Aristo-Craft. The kit is a very good buy and makes an attractive scale model. At the recent Sussex Air Show, I even won first place in stand-off scale!

**Here's the address of the manufacturer featured in this article:*
Aristo-Craft/Polk's, 346 Bergen Ave., Jersey City, NJ 07304. ■

HELI VIBRATION

(Continued from page 41)

...A Pound of Cure

The next step is testing your machine. If you've followed the manufacturer's suggestions and my recommendations, there's a 99-percent chance that the machine will lift off smoothly without vibrating.

Now to the the remaining (very important) 1 percent. If the helicopter vibrates now, there's a dynamic balance problem, or you've done something wrong. If you notice a high-frequency vibration (foam in the tank or vibration in the stabilizer) you probably haven't properly balanced the tail blades, or the starting shaft is still "out."

The only simple way to dynamically balance a main rotor is by trial and error. With a little patience and two tanks of fuel, all vibration can be eliminated. The adjustments can be made using some tape and an Allen wrench.

- First, move the collars on the flybar slightly, secure them, and hover the helicopter again. If the vibration is reduced, move the collars a little more, secure them, and hover again. If the vibration gets worse, return the weight to its original position, then move the weight in the opposite direction; secure it and hover again. You'll soon get a feel for playing with these weights. You might not rid your machine of *all* vibration, but it's important to reduce it as much as possible.
- Second, when you're satisfied with the position of the weights, adjust the blade weight. This is your *last* shot at making your helicopter run smoothly, but this method really works! By using this technique, I've even made machines with bent shafts run smoothly.

The procedure is simple, but you might have to repeat it several times. Start with a piece of tape about 3/4 inch wide and long enough to wrap around the blade completely. (Later, you might decide that you need two layers of tape.) To start, just pick a blade and wrap a layer of tape around the CG point (wrapping it widthwise) and lift the helicopter off the ground.

(Continued on page 72)

PLANE FACTS ABOUT MODEL ENGINE NOISE!

A different analysis of our sport's most critical issue.

by JOE WAGNER

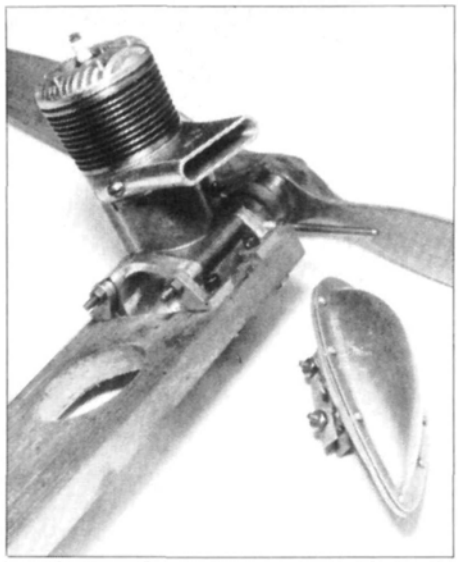
MANY MAGAZINE articles have been written about the noise that model airplane motors make. Most clubs enforce strict "muffled engines only" field rules, and the AMA even has a special committee on engine sound levels. There's no doubt that this subject is important to all R/C modelers. After all, "excessive noise" is the most common complaint leading to the loss of flying sites. That's why it's unfortunate that most of the current information about engine noise is *wrong.*

The decibel level numbers involved in this subject are accurate enough; there's little question about that. But the *meaning* of these figures has been grossly misunderstood. Decibels aren't really units of sound energy, and there isn't much of a relationship between decibels and the irritating quality of noises. The rule of thumb that a drop of 3 decibels means a 50-percent reduction in sound output, while objectively true, is completely false at the subjective level, i.e., what the hearer experiences.

Now, I'll explain these surprising statements. Decibels are actually *relative power factors* on a logarithmic scale. On a *linear* scale, 20 is twice as high as 10, and 30 is 3 times as high. But on the *logarithmic* decibel scale, 20 is 10 times as high as 10, and 30 is 10 times higher than 20.

The original power-factor unit was the "bel" (named for Alexander Graham Bell), and this was used in analyzing transmission problems in early telephone systems. A loss of one bel represented a drop in power level to one tenth of what it was originally. A gain of one bel (by amplification, say) meant an output power 10 times as high as the input.

However, the bel turned out to be too large a unit for convenient use in modern technology, so the decibel took its place. A decibel is 1/10 of a bel, just as a decigram (a seldom-used metric unit of weight) is 1/10 of a gram. Because the bel scale is logarithmic, involving multiples of ten rather than a straight numerical relation, the decibel scale is also logarithmic. For example, a gain of 1 decibel (dB) represents a power increase of 1.259 times; 2dB indicate a boost of 1.585; and 3dB up mean an increase of 1.995. That's why a 3-decibel drop equals a 50-percent power reduction.



The first model engine muffler marketed in the USA was the Orwick-made MUF-LET of 1946. It had steel-wool packing, internal baffles, and exhaust escaped through a narrow gap between the two halves.

If these figures seem confusing and illogical, try looking at them this way: A gain from, say, 50 to 60dB is a 10 decibel change, or 1 bel. By definition, that's a tenfold power increase. Subdividing the 10dB difference: from 50 to 53 is 3dB up; 53 to 56 another three; 56 to 59 three more; and one further dB makes it 60. Work it out on your calculator: 1.995 multiplied by itself three times (representing three successive boosts of 3dB each) equals 7.94. That number times 1.259 (for the last dB) gives you 9.996—mighty close to a total gain of 10.

Did you notice that in this explanation of decibels I haven't mentioned sound at all? That's because decibels are no more a measurement of actual sound output than watts are of light output. We use watts to specify sizes of electric light bulbs merely because watts are easy to measure, not because they define any quantity of light. After all, a 100-watt bulb painted black emits no light whatever, but it still consumes its 100-watt quota of electricity whenever it's turned on. Watts are *absolute* units of power. They can be used to specify the amount of energy used to produce light, heat, motion (as by an electric motor), or sound.

Decibels, on the other hand, are *relative* units of power. They don't tell you directly how much energy is involved in whatever is being measured. They only let you know how many times more (or less) power there is than whatever standard value has been selected as a starting place.

Long ago, a standard was chosen for the decibel scale as it relates to sound measurement. It's a pressure of 0.0002 dynes per square centimeter at a fre-

Radio Shack's sound-level meter costs a mere $30, and is well worth its price in educational value. With it, one can learn a lot about the loudness of all sounds.

The 15-inch muffler on this Super Cyclone .65 is steel-wool packed, and the exhaust exits from the angled slots at the rear. This bulky 1947 setup was quiet, but never became popular.

quency of 1000 hertz (which is two octaves above middle C). An arbitrary value of 4dB has been assigned to this, which represents the lowest level of sound audible to normal human ears. That appears to be a straightforward standard, but, unfortunately, our ears are more sensitive to some sound frequencies than to others. Two noises, each registering 85dB on a "sound meter," can seem very different in loudness to a listener if their frequencies are dissimilar. Most decibel meters (such as my own Radio Shack unit) incorporate "weighting." This attempts to simulate the frequency sensitivity of the human ear. A meter so equipped registers decibels on what is termed the "A" scale, and its readings are often specified as "dBa."

However, this isn't a great improvement, as engineers involved in noise reduction programs learned years ago. Trying to better numerically define the problems they have to solve, these engineers came up with new units of sound measurement. They call one "perceived noise" decibels; another is appropriately named "noys." These new units depend more on human judgment than measurement by scientific instruments. A "jury" of several dozen people rated sounds of various pitches and intensities according to their degree of unpleasantness, and the units were defined through a consensus of the jury members' opinions. What it all boils down to is this: Personal reaction to noise turns out to be far more a matter of subjective impression than it is of readings on a meter.

I recently asked a dozen people to tell me what was the most irritating noise they could think of. Their answers were nearly unanimous: the sickening screech of hard chalk scraped down a slate blackboard. A friend located a big old-fashioned blackboard for me in a local church. There we took decibel readings with my sound meter of the loudest screeches we could manage to produce—noises my friend said were literally unbearable for more than a second or so. (I couldn't tell myself, because I've been totally deaf since 1959; mostly as a result of over-exposure to jet-engine noise.) With my sound meter less than 1 foot from the blackboard, the highest reading I got was only *83dB.* That's the same as the meter indicates inside my VW Super Beetle at 55mph, or on my front porch when my next-door neighbor is mowing his lawn. We also tried scraping our fingernails down the blackboard. This also produced an extremely irritating noise, but the meter needle never went past 74dB!

Some highly annoying sounds won't register at all on a decibel meter: the whine of a mosquito, for example, or the drip of a leaky faucet when you're trying to get to sleep. No, there's no direct relationship between decibel levels and irritation. Think of a musical tone played by an accomplished trumpeter versus the "sour note" of a beginner on the instrument. They'll read much the same on a meter—but what a difference to the listener!

After reading my description of how the decibel scale works, you may have wondered why such a complicated way of rating sound was thought up in the first place. Why not measure it in linear units, as electricity is in volts and amperes?

Sound, insofar as it affects people

ENGINE NOISE

anyway, has to be evaluated in non-linear terms because human hearing itself is non-linear! Think about it. The loudest non-harmful sound level is regarded as being around 110dB, where the lowest audible sound is defined as 4dB. That range represents a difference in power output of *forty billion to one.*

Does a hi-fi playing rock music (or Stravinsky) seem forty billion times as loud as a baby's sigh? Of course not—and that's the reason for the decibel scale. It's an approximation of the way the human auditory system responds. Earlier in this article, the math showed how decibels relate to the *power output* of sound; but the way our ears and brains react to sound is something else again. In this area, the decibel scale *is* linear, or nearly so, with respect to loudness. A noise that registers 60dB seems only about 20 percent greater to us than one of 50dB, even though the power involved is 10 times as high.

That's why a model-engine muffler that cuts exhaust noise from 90dB to 87—a sound-power reduction of 50 percent—doesn't appear to be especially effective to the average bystander. It doesn't lower the noise *he* experiences by more than a few percent. High dB levels aren't in themselves unbearable. Loud sounds are everywhere these days. Aside from rock music, truck engines, and chain saws (all of which frequently top 100dB), people are regularly exposed to high noise levels from power tools and household appliances. An automatic washing machine puts out close to 80dB; my Hoover carpet sweeper registers 90dB, and my shop vacuum turns up 95. In fact, only one power tool in my workshop runs under 90dB: my disc/belt sander at 88.

Recently, I took my sound meter out to our R/C club's flying field. Taking decibel readings at the runway's edge, while three .40- and .45-powered airplanes were simultaneously flying overhead, I was astounded by the meter reading: a paltry 72dB maximum! Decibels are *not* the problem we need to address to safeguard our flying sites.

The Penn-Ohio Radio Kontrol Society (PORKS) were evicted from three club flying locations in just a few years. Each time, the reason was supposedly excessive noise. But Harry Montgomery, one of the club's top officers at the time, investigated all the circumstances carefully, and came to the conclusion that the *real* reason the

(Continued on page 72)

Sig's super sport soarer... build your own!

Author's wife, Mary, with her bright red new bird. White stripe on the Riser's right wing helps with orientation.

PHOTOS BY JOHN LUPPERGER

by JOHN LUPPERGER

SIG MANUFACTURING CO.* has been making model kits for more years than most of us have been involved in the hobby, and it has one of the largest (if not *the* largest) kit lines available from an American kit manufacturer. Sig's kits run the full gamut of radio control, free flight, and U-control. With a span of 100 inches, the Riser 100 is Sig's first "big" glider.

Designed by Mike Pratt, the Riser is a standard-class glider for sport and competition flying. Sport pilots should find its size and rugged construction suitable for Sunday fun-flying, while competition pilots will find that it's capable of a performance that can deliver them to the winners' circle.

The kit's quality is typically Sig. The hardware and small parts were bagged,

SPECIFICATIONS

Type: *Glider*
Span: *100 inches*
Weight: *45 to 49 ounces*
Length: *48.5 inches*
Wing Area: *1,000 square inches*
Wing Loading: *6 to 7 ounces per square foot*
Airfoil: *Modified Eppler 205*
Number of Channels Required: *2 to 3 (rudder/elevator/optional spoilers)*
Suggested Retail Price: *$69.95*

Review Model:
Weight: *49 ounces*
Wing Loading: *7 ounces per square foot*
Radio: *Futaba 4NL transmitter; Cirrus Aero Sport 4-channel receiver; two Aero Sport DB servos; one Cirrus CS servo, and 500mAh battery pack.*

The Riser 100 looks great in the sky, and flies just as well. Red coloring and white stripe show up clearly and help with orientation.

and the wood was bundled and held together with rubber bands. Everything was well-placed in the box to prevent damage during shipping.

The hardware was of good quality, and included everything needed for the finished model. The die-cutting was very good, but this is to be expected in a new kit made with new dies. Wood quality was fairly good, but a few pieces were overly hard and heavy. As with other Sig kits, there were also printed wooden sheets that have to be cut by the modeler. I think that Sig should die-cut these pieces along with the rest of the kit. In the instructions, the explanation given is that the die-cutting process would yield a poor parts fit because of the thicker wood used in these parts. Chances are, though, most modelers won't cut out the parts any better than die-cutting would.

There are a couple of options that must be decided on before beginning construction. The Riser can be built as a 3-channel model with the addition of spoilers, and I decided to use this option for added control during landings. The second option is a bolt-on wing, but I opted to pass on this one, as the wing needs four bolts to hold it on. This seems overly complicated for this type of model; the rubber-band hold-downs work fine, and the Riser isn't likely to see many zoom launches.

SIG MANUFACTURING

RISER 100

Since the Riser is intended to be a trainer, my wife has written the flying part of this review. Mary quit flying about four years ago, at which time she was flying a similar model—the Oly II. This was her only model, and I thought that *her* comments on the Riser's handling would have more meaning for novice fliers.

I'll review the construction and add some comments to the flying section. So, let's get on with the building!

CONSTRUCTION: This starts with the fuselage, which is made primarily of lite-ply. After punching out all the die-cut parts, you drill holes in the bulkheads for the pushrods. Then, using rubber bands, the fuselage is constructed *without* gluing. The fuselage sides have notches cut into them, and these accept tabs located on the bulkheads. When everything is square, all joints are glued using thin CA. The rubber bands are removed, and balsa stringers are glued into place in the canopy opening and the wing saddle.

Next, the holes for the wing rubber-band hold-downs are drilled in the fuselage sides. The canopy and nose block are glued into place and rough-shaped (the canopy is only tack-glued). After shaping, the canopy is cut loose from the fuselage and a 1/16-inch ply tongue is glued to the front. A scrap piece of lite-ply is glued into the rear of the canopy opening. With the tongue holding the front of the canopy, a hole is drilled in the rear and through the lite-ply cross-brace. This hole is for a 4-40 nylon hold-down bolt

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HELI VIBRATION

(Continued from page 62)

If the vibration is worse, take the tape off and put tape on the other blade at its CG. If the vibration is reduced, you're on the right trail! When you've stopped your rotor blades, clean them thoroughly so that the tape will stick well. Obviously, you can now do one of three things: Move the tape in; move the tape out; or add more tape.

When you've discovered the point where tape produces the most reduction in vibration, add more tape until the vibration is eliminated. When the proper position and/or weight is finalized, make sure that the tape is sealed at the edges with some instant glue to prevent it from lifting.

Conclusion

Since I've discussed all the possible causes of vibration, you can now avoid the problem. If, after a crash, you're having problems with vibration, you can bet dollars to doughnuts that you either have a bent shaft (any one of three) or something is out of balance. Take your time and you'll make your own good luck! ■

ENGINE NOISE

(Continued from page 66)

PORKS lost their fields was the irresponsible behavior of a few inconsiderate club members. This led to personality conflicts with property owners, who retaliated by complaining about "excessive noise" to local officials. As a result, three very good sites were closed to all model flying—even gliders! It was much easier to use noise as evidence against the model club than to put on display the personal feelings that were the real issue.

In contrast, the Flying Dutchmen Club has been using a hilltop site only 3 miles outside the city of Reading, PA, for more than 20 years with no noise complaints whatever. The club has about 40 active members who fly U-control there—the most irritatingly noisy type of model activity because of the monotonous "wow-wow-wow-wow" sound the airplanes make going around and around and *around*. Few of the Dutchmen use mufflers. They power their models with engines of all sizes, including many .60s. They even do a bit of control-line speed flying at the club's field, which is only a mile or so from homes and businesses.

How do the Flying Dutchmen get away with this? According to Bob Diefenderfer, the club's publicity director, it's mostly good public relations. The club puts on many public flying demonstrations and model displays; they welcome youngsters and newcomers to model flying; and, in general, they're good neighbors and nice people to have around. Nobody wants to evict folks like that just because they happen to make a bit of a racket with their hobby.

Our personal attitudes and behavior are more likely to determine whether a flying site stays open than the number of decibels our motors produce. I've seen arrogant, insensitive, and dangerous behavior by some modelers, and if they were flying from a field in *my* neighborhood, I'd do *anything* I could to have them stopped. Even though I'm totally deaf, I'd complain about the excessive noise! ■

FIFTY YEARS AGO

(Continued from page 14)

The "Gas Lines" column told readers about the latest Russian models. Apparently, in the U.S.S.R., there were no fuel limits or motor-run limits; they just put in as much gas as possible and "let 'er go"! The model shown in the photograph stayed in the air as long as *five hours!*

Finally, just to show that some things

never really change, "How to Organize a Club" by the "Instructor" asked "Do we want *girls* in our group?" The answer? Of course!—although the writer was a little vague about whether these "girls" would actually be allowed near the planes! "Snare somebody's good-natured sister to serve as Recorder. She'll keep track of activities, the progress of members and the contest results...Surely you know another young lady who would be a dandy librarian"! I don't know about you, but from where I'm sitting I notice a shortage of these "dandy, good-natured" females, but increasing numbers of women aero-modellers. Right, Mary Lupperger? (See the "Field & Bench" review of the Sig Riser in this issue.)

One thing was sure: *Model Airplane News* was right there with full coverage of all developments in aviation, and you can tune in fifty years *from now!* ■

ELECTRILITER

(Continued from page 20)

later. If you want to add this touch, it goes just in front of the battery hatch.

By far the easiest way to build the motor mount is by using a 1 1/2-inch hole saw to drill the holes in F2 and F3. Then, saw the notches for the hardwood mounts with a coping saw or a jigsaw. This type of mount works very well with a rubber-band motor attachment.

Build the cowl along with the fuselage by adding F1 in front of the fire wall (F2), then, when the fuselage is complete and sanded, slice it from the fuselage to make it even with the front of F2. Glue the 1/8-inch-square balsa guides and the plywood screw anchors to the front of F2, slip the cowl into place, and then drill holes in it and in the screw anchors for No. 2 mounting screws. It might be a good idea to reinforce the cowl in the screw area with a half-circle of 1/64-inch plywood, or you could harden the area with thin CA.

The whole airplane is covered with Black Baron* film, and the same material is used for the hinges. The new transparent Black Baron would be great on the wings and stab, too. Follow the instructions packed with the film.

Radio installation is straightforward with 1/4-inch-square balsa pushrods joined to the control surfaces. The original had a very old 3-channel "brick," which was quite heavy, but reliable. Balance the airplane by moving the servos, flight battery and radio battery around until balance is achieved at the point shown. The "throttle" servo is mounted forward to shorten the motor wiring, and the microswitch is attached to it with servo tape. (This "throttle" switch is in addition to the motor switch.)

The original weighed in at 40 ounces, and the installation of a modern radio should reduce this by at least 4 ounces. But, even at 40 ounces, the Electriliter performs well.

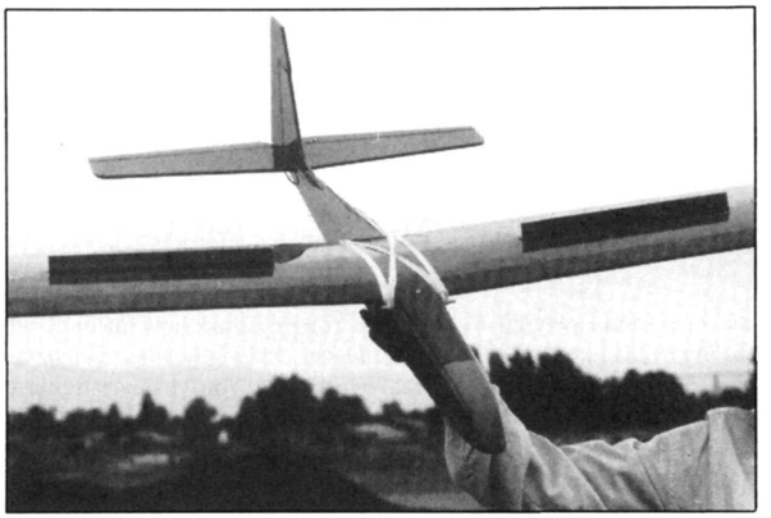
PERFORMANCE: No surprises here! Just charge it up, turn it on and throw. It will climb at a 30- to 40-degree angle up to 400 or 500 feet in a minute or so and, if you kill the power, the same charge will allow you to do that a couple more times. Under power, it will loop, roll and snap—even fly inverted. In the glide, which is not quite as good as that of a true sailplane, it will hang into relatively light lift. Even at very slow speeds, the tip dihedral and large rudder give crisp response, which is nice to have when dodging trees, bushes and stumps, or goalposts and back-stops during landing!

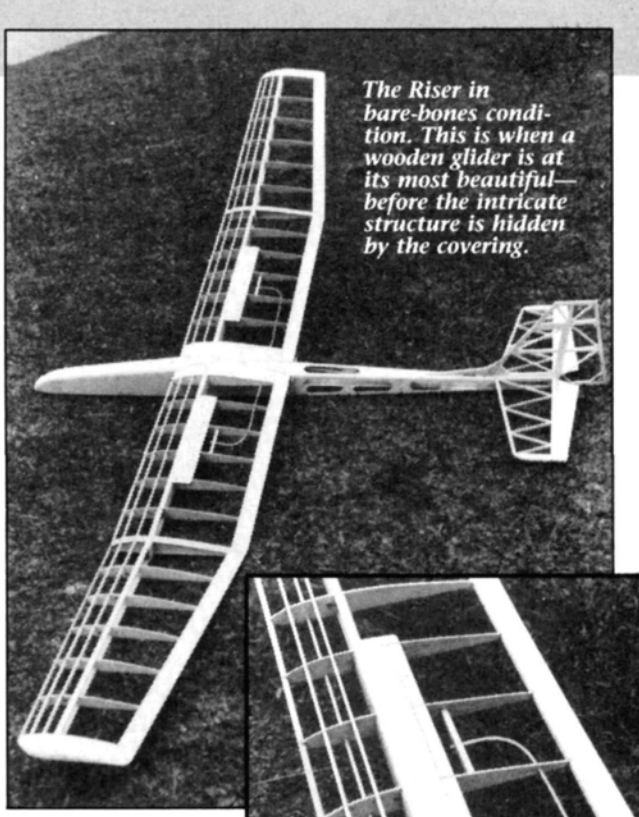
**Here are the addresses of the companies mentioned in this article:*

Twiliter Series; MAN Plans Service, 251 Danbury Rd., Wilton, CT 06897.

Ace R/C Inc., 116 W. 19th St., Box 511C,

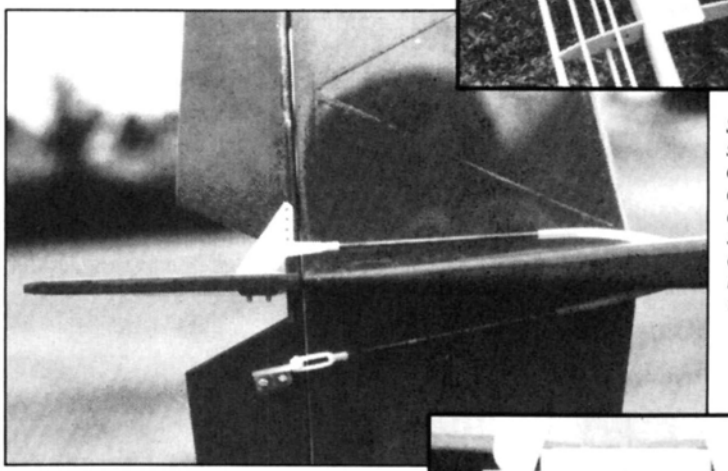
(Continued on page 90)



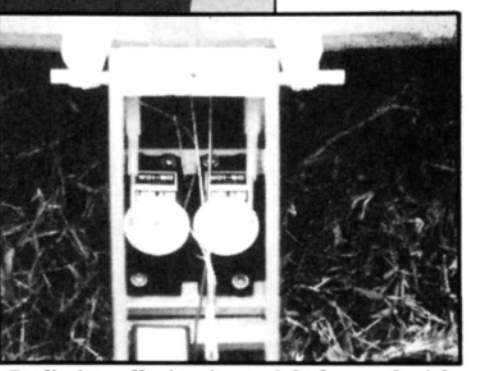


The Riser in bare-bones condition. This is when a wooden glider is at its most beautiful—before the intricate structure is hidden by the covering.

***Above:** If the rather large spoilers are fully opened, the Riser runs out of elevator. Spoilers only need to open about 45 degrees to be effective and maintain elevator control.*



Spoiler detail shows routing of spoiler-cable tube and strips to support covering around blade opening.



***Above:** My only real complaint about the Riser kit is that the pushrod exits are too far from the control surfaces. To help reduce the pushrod flex, I used longer wires instead of the threaded studs recommended in the instructions.*

Radio installation is straightforward with plenty of room for full-size gear. Spoiler cable runs between the rudder and elevator servos.

and blind nut.

The final step is gluing-in the nylon, outer pushrod sheaths. The outer sheath is passed through the holes in the bulkheads and the rear of the fuselage. They're securely glued wherever they pass through a bulkhead or touch the fuselage sides. They're then cut flush to the rear of the fuselage with a single-edge razor blade, and the fuselage is final-sanded to a smooth overall finish.

The wing is built directly over the full-size plans. The center-section is built first, starting with pinning the trailing edge and spars in place according to the plan (cross pins over spruce spars; *never push* pins through spar material). Sheeting is cut for the bottom rear portion of the center section. The ribs are glued into place, and the center ribs are glued in at an angle (using the supplied dihedral gauge) to match the center dihedral angle. The top spar, turbulators, and birch-dowel leading edge are then glued into the appropriate rib notches.

The wing-joiner tube is inserted through the first and second ribs of each panel, and the two panels are brought together on the 1/4-inch wing joiner wire. The tube is tack-glued into place, packed with balsa, and capped with the 1/16-inch balsa shear webs.

If you're installing the spoilers, this is the next step before starting the tip panels. Two of the W-2 ribs are notched to allow the spoiler to set even with the top of the wing. Next, 1/6x1/2-inch sheet strips are cut to fit between the ribs, directly behind the spoiler and at each end. This sheeting is necessary for attaching the covering material around the spoiler. The spoiler tube is glued into place, and it passes through the bottom sheeting just behind the main spar. The top sheeting is then installed in the center section.

The tip panels are framed in the same way as the root section, and the tip blocks are glued on and shaped. The tip is raised 3 3/4 inches above the work surface, and the spars and trailing and leading edges are sanded at an angle to match the root section. The dihedral brace is glued in with epoxy and the shear webs are glued into place. To facilitate covering, the ribs at the dihedral angle have 1/16x1/4-inch strips of balsa glued to their sides (like cap strips).

The 1/8-inch rear-alignment pin dowel is glued into the left panel, and a 1/8-inch receiving hole is drilled in the

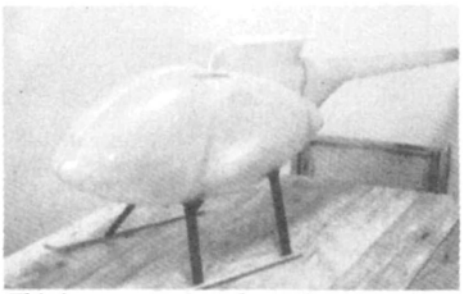
(Continued on page 106)

Helicopter Challe

by CRAIG HATH

WELCOME BACK TO our series on flight training. This month's examination of forward flight is, without a doubt, a very real milestone for any fledgling helicopter pilot. Those months of practice can finally pay off in one single, successful circuit around the field. Like a full-size machine, competently entering and exiting forward flight ensures the independence that soloing brings.

Over the years, I've observed many pilots working through this phase, and I've compiled a list of "dos and don'ts" that



This is a new project the author is working on. It's a Hughes 530G that was designed specifically for the Kalt Cyclone. Perhaps it can be modified to model the new tail rotor-less NOTAR from McDonnell Douglas?

I'm ready to share with the rest of the world. But, first I'd like to examine preparation and some other extraneous information. I'll assume that the steps outlined in the previous columns have been completed, and that your level of confidence will permit you to make the next move.

Final mechanical preparation for forward flight would include a thorough inspection of the helicopter, ensuring that the machine is in good repair. For instance, look for any loose nuts or bolts and inspect for damage that might have produced cracks and hidden problems, and then repair any damage before proceeding. It's always best to get the odds in your favor, so don't skimp in the maintenance department.

Once you're certain that your machine is in good shape, take a look at the pitch curve of the main rotor system. If you've been using a limited-travel setup to avoid hard landings caused by over-controlling the throttle/collective, now is the time to open up the curve again. Usually, the pitch curve is set for hover training, so there's about 1 degree of positive pitch on the low end of the stick travel and rarely more than 6 degrees or so on the top end. To get into and out of forward flight, set the low end at about 1 degree of negative pitch, while selecting around 7 degrees of pitch at the top. This adds a slight cushion to the flight envelope, allowing the helicopter to recover from less-than-perfect approaches. If you're unable to get a small amount of negative pitch into the main rotor system, the machine will tend to "float," making it very difficult to land the helicopter on or near any desired spot. Some negative pitch added at the right time will cause the helicopter to sink and lose forward momentum much more easily. You should also have a little more positive pitch on the top end, and this will make the helicopter respond more quickly to throttle inputs when the machine

When practicing your approaches, be careful not to get the helicopter into too steep an angle of attack. This invites a stall, which can lead to a crash.

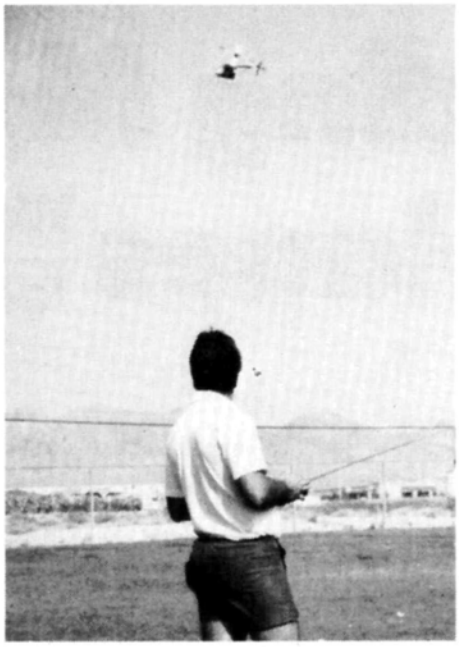
appears to be settling too quickly. The ultimate goal is to set up the helicopter so that the performance will be as forgiving as possible.

Your state of mind is also critical to your success. Most athletes who have won an event will tell you that they visualized themselves performing their events perfectly. You might ask how that will aid your situation, especially when you have no real experience. You've never flown a helicopter in forward flight and you aren't experienced enough to maneuver your machine into the unknown and back to the

As the helicopter comes past you, it should be at about head level, like this. This is the point where you start to flare the helicopter to the landing.

ground without creating a pile of rubble. But think about it: Is that really true? You've already flown your machine in circles around yourself, and you can hover it just about anywhere you want it. What will the difference be when you open the throttle and let this machine head for the wild blue? Tell yourself that you're ready for this next step and that you're capable of handling it. Read the procedures outlined in the next few paragraphs and be sure that you understand them. Try to paint a mental picture of you and your helicopter performing this flight. One approach is to describe an ideal flight in detail (including the control inputs needed to guide the machine around the sky) while, at the same time, pointing out some common errors that can get you into trouble at that particular moment. With this in mind, let's head to our imaginary flying field.

Try to pick a day that has a slight wind blowing in a direction that allows you to get the machine airborne without pointing it at any obstacles, and likewise for the landing. Your flight direction will



Begin your approach to landing like this: Pick a spot on the ground where you want the helicopter to touch down, and draw an imaginary line to that point from the helicopter.

begin and end with the helicopter heading straight into the wind. Light winds will help to keep the nose pointed into the breeze during the transition back into hover. You might even consider trying the first flight with the winds on the strong, but steady side—say around 15mph. Gusty conditions can be dangerous, so try to avoid them at first. Unpack your gear, and prepare to fly!

Begin by putting your machine into a hover and limber-up your flying fingers. Maneuver around, practicing your slow forward circles from the last lesson, until you've warmed up both mentally and physically. As the helicopter moves around the circle to the point where the nose is heading into the wind, and the helicopter is moving away from you, open the throttle/collective slightly in gradual steps until the machine begins to climb slowly, both vertically and horizontally. You'll notice that you don't need to change any other control for the initial climb, other than a slight possible correction of the tail rotor to compensate for the added torque from the engine.

Bring the helicopter all the way to the ground after it has passed you. This way, you'll be working from the tail of the machine, and you'll be more comfortable with the position of the helicopter.

When the helicopter starts climbing at a comfortable rate, stop increasing the throttle. Do *not* automatically advance the throttle to wide open in a nervous attempt to keep your machine in the air. A helicopter becomes more efficient in forward flight than it does in a hover, and it actually requires a lower throttle setting to maintain lift.

Most beginners are instantly in trouble, because they use too much power in forward flight. The machine will try to climb, requiring some down cyclic. Along with this comes increased forward speed, requiring more quick decisions, which is exactly the opposite of what you want right now! So now that the helicopter is moving along, pull the throttle back just a hair, and fly around while trying to relax. As the machine moves away, start a turn while the helicopter is still easily visible. Be sure that the first turns are away from you, so that you don't fly over the pit area at your field or toward any other obstructions.

Start the turn by giving a small amount of roll cyclic in the direction in which you want to move. Now it becomes necessary to watch the helicopter and correct for any excessive heading changes. Normally, you'll want to add a slight amount of tail-rotor pitch in the same direction as the roll cyclic. This procedure will bring the tail around with the rotor disc, and is referred to as a "coordinated turn." Due to the slight decrease in lift caused by tilting the rotor head off from level, you may also need to hold a slight amount of back cyclic at the same time to prevent the nose from dropping. A common pilot error is the tendency to over-roll the cyclic, when, in fact, the turn could be made by using more tail rotor. You'll roll the helicopter over onto its back if you don't correct for an over-roll. Try not to freeze on the controls, and keep thinking all the time that, if you get into trouble, you should do the *opposite* of what got you into it. For instance, if the helicopter seems to over-roll too much to the right, give it some left cyclic. If it climbs too much from back cyclic, give it some forward cyclic to counter, etc. To maintain altitude, it may be necessary to increase the throttle slightly in the turns.

For a few circuits, work on flying around in figure eights at the same altitude. Double-check to be sure that you're not letting the machine increase in forward speed or get too high. Remember that the natural tendency will be to increase the throttle to wide open. Keep working with the throttle to get a feel for how it affects the flight. You'll need to hold a slight amount of forward cyclic to keep the machine from stopping in the sky.

Continue flying around until you're comfortable with this phase. Take your time and enjoy watching your machine move about the sky. At this point, you should have little trouble guiding your machine through the air, and you should discover that actual forward flight is easier to control than hovering.

With your confidence soaring, start a descent by reducing the throttle as the helicopter comes around with its nose heading into the wind and its rotor disc level. Try to get a feel for how the helicopter descends. If you've kept the speed of the machine down, it will settle into a glide slope that's very predictable and stable. If the machine is too fast, it will zoom by as if you hardly did anything. Be sure that you only reduce the throttle enough to get the machine into descent. A common mistake is pulling the throttle completely off to get the helicopter to move toward the ground; the next mistake is that, in an effort to reduce the rate of sink, the pilot will pull back on the cyclic to keep the nose up. The direct result of this program, if allowed to continue, will be to reduce the rotor speed to a point below flying lift, so causing a stall. Try to get the helicopter to come down at a 30- to 45-degree angle. Start the descent at a

(Continued on page 112)

Building Model Airplanes

Woodworking Techniques

by JOE WAGNER

IN MY PREVIOUS columns on model building, I wrote about the most useful adhesives and cutting tools for our hobby. Now it's time to discuss the constructive areas of model building: shaping and assembling the component parts of our airplanes.

The key is *accuracy*. When parts are made precisely, they fit together easily, and the extra time it takes to cut them accurately is more than made up for by the time saved in assembly. To accurately shape the parts for your model airplanes, you don't need a lot of equipment, but I've found a few inexpensive special-purpose tools that are well worth having. They'll save you a lot of time and material, because they'll enable you to make parts that fit properly on your very first try.

- Fourmost's Miter Master makes it easy to fit crosspieces into a built-up fuselage or tail framework. It's also useful for squaring the edges of sheet-balsa bulkheads and similar model parts. I've been using mine for more than three years, and I don't know how I ever got along without it! (Ace R/C* carries it, if your local dealer doesn't.)
- Master Airscrew's* balsa stripper is another special-purpose tool I often use to cut precise strips from stock balsa sheet. With this tool, I can quickly make wing spars of identical weight, and fuselage longerons that are all equally hard. This makes constructing balanced wings and undistorted fuselages much easier than when working with random, pre-cut sticks.
- Master Airscrew also manufactures a neat little modeler's plane, which has a razor-blade cutting edge. This tool is ideal for "radiusing" wing and tail leading edges, rough-tapering elevators and ailerons, and shaping cowl blocks. X-Acto makes a similar-size modeler's plane, but I prefer Master Airscrew's tool, because its blade is easily replaced.
- FAI Model Supply's* Mini-Miter is another special-purpose tool that I use frequently. It's a plastic miter box used with a razor saw (e.g., X-Acto's) to produce truly square or accurately angled end cut-offs of balsa and spruce spar stock. While the miter box holds the wood firmly, the razor saw cuts so smoothly that the end doesn't have to be sanded.

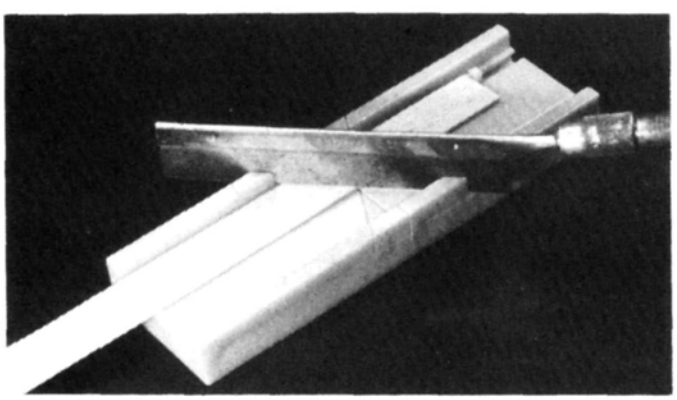
However, most of the time, it's necessary to sand the edges of model parts. Despite more than half a century of model-building experience, I still can't trust myself to cut a wing rib or a tail outline piece precisely to size with a knife or a razor blade. That's why I always cut such parts a little *outside* the line, then sand them to the exact shape required. When I construct the outline of an elliptical built-up stabilizer (for example), I use a sneaky technique I wish I'd thought of years ago, when, trying to cut them to fit together properly over the plan outline, I routinely ruined *many* little sharp-angled wingtip and tail pieces.

I now do this kind of job by assembling an oversize, roughly shaped set of balsa pieces on the plan outline. Only the edges that are to join are accurately cut to fit; everything else is left big enough to overlap the outline inside and out. When all the segments have been glued together, I trace the desired contour onto the roughly assembled unit and then cut and sand it to final form.

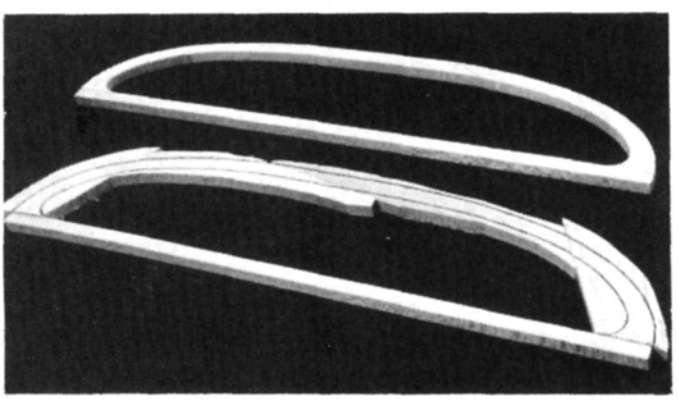
The same method works with cowl blocks, wingtips and built-up bulkheads. This may *seem* to be a waste of material, but, in the long run, I think it actually *saves* wood. (I know that it definitely saves time!)

Balsa Bending

As well as cutting and sanding, there's another way to shape balsa: forming it wet, or with steam. When balsa is saturated with water, it's extremely pliable. I've even been able to form compound curves in wet balsa, e.g., leading-



FAI Model Supply's miniature miter box and an X-Acto razor saw provide an easy means to make clean, exact end cuts in balsa and spruce.



Built-up curved outlines the easy way! In front is the rough assembly, with only the joints made with precision; in back is the cut-to-shape part.

edge sheeting on an elliptical wing, and a one-piece fuselage top for a scale Lockheed 10A Electra.

To work successfully with wet balsa, you must be aware of two things: First, it takes a long time for water to *totally* penetrate all but the thinnest sheets of balsa. True, the *surface* is soaked as soon as you wet the wood, but it takes about an hour for every 1/16 inch of thickness to really saturate balsa. Hot water works somewhat faster, but it still takes a while. If the wood is merely wet on the surface, it might split or fracture when you try to form it, but when it's wet through, you can almost tie knots in it without breaking it!

A popular misconception is that an ammonia solution will soften balsa. True, *concentrated* ammonia (strong enough to sear your lungs if you inhale it) plasticizes the lignin in hardwood (e.g., birch) and facilitates the manufacture of office furniture from plywood, for example. Balsa, however, contains practically no lignin, and, in any case, most available household ammonia solutions are far too dilute to soften lignin in any kind of wood.

Household ammonia does have a *detergent* effect, so it soaks into wood faster than water, but if this were *all* it did, there would be no reason not to use it. Unfortunately, most household products containing ammonia (e.g., soap) contain other ingredients as well, and these remain in the wood and interfere with glue bonding.

Another problem encountered when working with wet balsa is that the wood *expands* when saturated with water. It gains more *across* the grain than lengthwise: A 3x36-inch sheet of balsa expands approximately 1/4 inch in both dimensions when waterlogged. Longitudinally, that's less than 1/10 of 1 percent expansion (which is negligible) but, *across* the grain, that's more than an *8-percent* expansion. As balsa dries, it shrinks to its original dimensions, so gluing a wet 3-inch-wide sheet into place on a wing leading edge will lead to some powerful trapped-in stresses as the structure dries. It's better to hold the wood to the desired shape with tape or an elastic bandage until it's dry, and then glue it into place.

As for steam-forming balsa, molding an airfoil in a single-surface sheet-balsa wing is an excellent application. I've made several wings this way, from very small glider and rubber-powered model wings to 6-inch-chord ones for R/C airplanes. They aren't good for inverted flight, but on all other counts they perform better than conventional airfoil wings: There's more lift, less drag, and higher strength in proportion to weight—and the wing outline can be any shape you like! A parabolic-curve planform is just as easy to make as a simple rectangle.

Use a pre-shaped mold to construct this type of wing. Begin with a rectangular sheet-balsa blank large enough for the wing you want to make, and, to prevent shifting, tape down its leading edge to the mold at each end. Next, cover the blank with a piece of sopping-wet denim salvaged from an old pair of jeans, and then iron the denim with a MonoKote iron or a flatiron until it's dry. The steam will penetrate the balsa and soften it so that it conforms to the mold's airfoil shape.

Immediately after ironing, remove the denim and, in its place, lay a sheet of thin,

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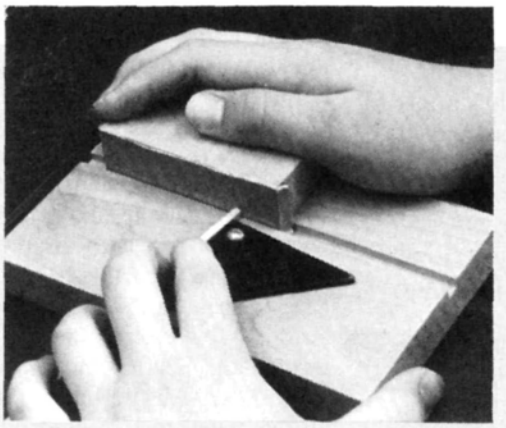
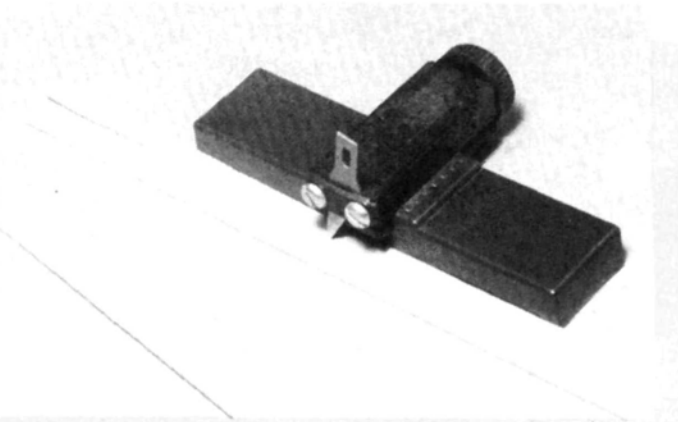
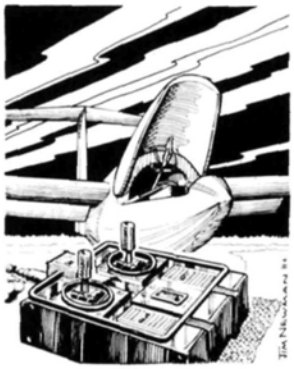




***Above:** Master Airscrew's balsa stripper. The No. 11 blade is adjustable for depth and easily replaced when it dulls. The knob regulates cutting width.*

***Above left:** Fourmost's Miter Master in action. The black triangular stop is adjustable, and the edge stop (for precisely squared ends) is retractable.*

***Left:** This .049-powered Osprey (full-size plans available from MAN) has steam-formed sheet-balsa wings. They're light, efficient and easy to make.*



Quiet Flight

by JOHN LUPPERGER

COMPUTERS ARE NOW common; if you order a product through the mail, the invoice—like our bank statements—will probably be computer-generated. The supermarket checkout is a very sophisticated computer that we take for granted, and many of us use computers daily at work, with only a minimum of training. And now, the computer is a tool for modelers.

Model Design Software

So far, Chuck Anderson* is the only programmer who has responded to my request for modeling programs. Chuck offers a number of programs for the IBM, Commodore 64/128 and Macintosh computers. These include: Airfoil Plot ($25); Wing Design† ($25); Wing and Airfoil† ($40); Soar Contest† ($25); Sailplane Airfoil Data Files ($10); Free Flight Airfoil Data Files† ($10). († Not available for the Macintosh.)

Doug Hertzog, proprietor of Douglas Aircraft, with new kit, the Silhouette. Slope model has good lines and uses foam-core wing construction.

The Airfoil Plot program is one of the best I've heard of, and it offers many options that open a new realm of creative design opportunities. The program allows the use of a very wide variety of printers. I have a program that works well with my older nine-pin Star SG-10 printer, but it won't work with my 24-pin Epson LQ-800 (even with a graphics identity card, it won't print proper airfoils). Chuck's program has options for all types of dot matrix printers, and it works with both my SG-10 and LQ-800.

The Airfoil Plot plots skin thickness and vertical station lines, it simultaneously plots mirror-image airfoils (for making foam-wing templates), and it automatically plots all ribs for a tapered wing. The principal programs used to accomplish this are:

- PLOT: Program used to plot airfoils on suitable dot matrix printers. The airfoils are printed vertically to allow printing of airfoils up to 45-inch chord and up to 6 inches thick. The program has graphics-control codes for Epson, IBM, Star, C. Itoh and Blue Chip printers.
- DATA: Program used to enter airfoil coordinates and save them to disc in the plot-program format.
- UTILITY: Converts computer-style coordinates to NACA-style coordinates, and combines the upper surface from one airfoil with the lower surface of another airfoil to generate a new airfoil.

The program disc contains other programs and batch files required to support these programs, as well as 42 airfoil-data files and a printer test-data file.

The Wing Design program has many of the capabilities of the Airfoil Plot program, plus additional features that include:

1. Transition from one airfoil to another from the root to the tip of a wing panel.
2. Plotting up to three I-beam wing spars, leading edge and trailing edge.
3. Automatically adding up to 5 degrees of washout to a wing panel. The program transitions from no washout at the root to the specified washout at the tip. Using a foam cutter, it would be possible to design wings with this program for almost any type of sailplane or task. The possibilities are almost limitless. You could take a high-lift Gottingen section at the root and use an Eppler 374 at the tip to create a wing that... Well, actually, I don't *know* what a wing like this would produce in the way of performance, but I'd like to find out, and now I can. If this interests you, contact Chuck and tell him you read about it in *Model Airplane News*.

Harlequin Challenge

A couple of columns ago, I challenged someone to build a Harlequin, to build several different wings with a variety of airfoils, and then to test the different sections under actual flying conditions and report the results. The Harlequin was designed with flat fuselage sides, which makes it easy to interchange panels and airfoils.

Well, the challenge was taken up by George Voss of Oklahoma City, OK. George has a Harlequin kit and says he'll start the project around January 1, so it will be well underway by the time you read this. George will use the Eppler 193, Selig 4061, and some of his original airfoils. We'll look forward to seeing the results, and hearing George's views on what differences he finds in the various airfoils when they're used on the same airframe.

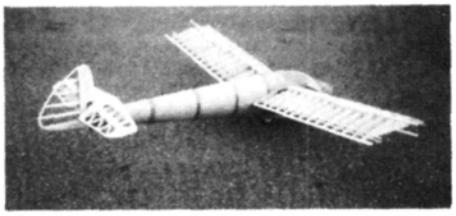
New Slope Kit

A new company, Douglas Aircraft*, is starting a line of slopers with its first model, the Silhouette, designed by Doug Hertzog. The model has some of the characteristic looks of the Shadow and the Son-of-Savage, and it's a sharp-looking model with good proportions. It has a wingspan of 43 inches, is 28 inches long, has foam-core wing panels, an extensive hardware package, rolled plans and detailed building instructions. Its root airfoil is a thinned Eppler 374 (the slope enthusiast's favorite airfoil), which transitions to a fully symmetrical section at the

(Continued on page 82)

QUIET FLIGHT

tip. With its small size and this airfoil combination, I suspect that the Silhouette will be a very quick, aerobatic model (within the limitations of two-channel operation). The introductory price is $53.49, and it's available from the manufacturer and retail outlets. An epoxy-fiberglass fuselage is also available, but only from the manufacturer, for $26.95.



Construction of Minimoa closely follows that of the full-scale ship. This is Gary's first scratch-building project—definitely not a beginner's model!

Gary Brokaw holds partially finished 1/4-scale Minimoa. Model's large size is evident with short inner panels not yet complete. Finished model will span 166 inches.

Plan Service

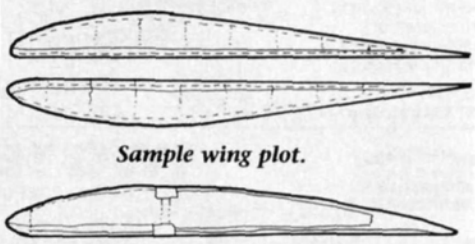
Some of you may have noticed that one plans service has a familiar name: JM Lupperger Plans.* Yes, I import the MAP Argus plans from England. There are three plans catalogs: "Plans Handbook 1" deals with all types of flying models (U-control, R/C and free-flight); "Plans Handbook 2" deals with static and R/C boats, steam traction engines, steam locomotives, petrol and diesel engines, and workshop equipment; "Plans Handbook 3" deals with scale drawings of all types of aircraft from around the world. The catalogs cost $3 each, or $7.50 for all three, and they contain over 100 glider plans, including scale, slope, thermal, and electric models.

This brings me to a letter and pictures I received from Gary Brokaw of Spokane, WA. You may recognize Gary's name, as he designed the A.F.A.R.T. system used in Dodgson's designs. Gary is one of my customers, and last year, he bought a 1/4-scale Minimoa plan. The Minimoa was designed by Chris Williams of England, who is well-known for his extremely accurate and good-flying scale sailplanes. The model spans 166 inches and flies on four functions: rudder, elevator, ailerons and spoilers.

This is Gary's first scratch-building project (what a start!), and he changed the blade-wing joiner for a 3/8-inch spring-steel rod, as he plans on winch-launching. When the tip panels are completed, Gary plans to fly the model *before* painting it. The spoilers are of the top-and-bottom variety, and Gary didn't feel like taking on the expense of buying two sets of $50 spoilers. Solution: Gary scratch-built his own. I hope Gary will send us pictures of the finished model and a full report of its flying characteristics.

The Minimoa is only one of over 20 scale sailplanes available from the plan service. If you're interested in scale sailplanes, there are a lot of interesting subjects available.

Sample airfoil plot.



Sample wing plot.

Sample airfoil plot shows the mirror-image airfoils for foam-wing cutting. Sample from the wing-plot program shows airfoil with leading edge, trailing edge, ribs, I-beam shear web, skin thickness and datum line.

Project Wanderer

Now that all of the construction is done, it's time to prepare your Wanderer for covering. Initial sanding should be done with a T-bar sander (I usually use the 11-inch model). With the T-bar, you can sand the tail surfaces perfectly flat without the danger of sanding dips in the geodetic braces or straight ribs. Lay the T-bar across the leading and trailing edges and sand the ribs in between. With the hard, aluminum, T-bar, all ribs and glue joints are sanded evenly.

The bottom of the wing is sanded in the same way. By straddling the T-bar across the leading and trailing edges, the ribs are all sanded flat and even. I also use a T-bar on the top and bottom center sheeting as well as on the joint between the ribs and the trailing edge. (The T-bar is also good for roughing-in the leading edge.) All the sheeting on the fuselage is given a once-

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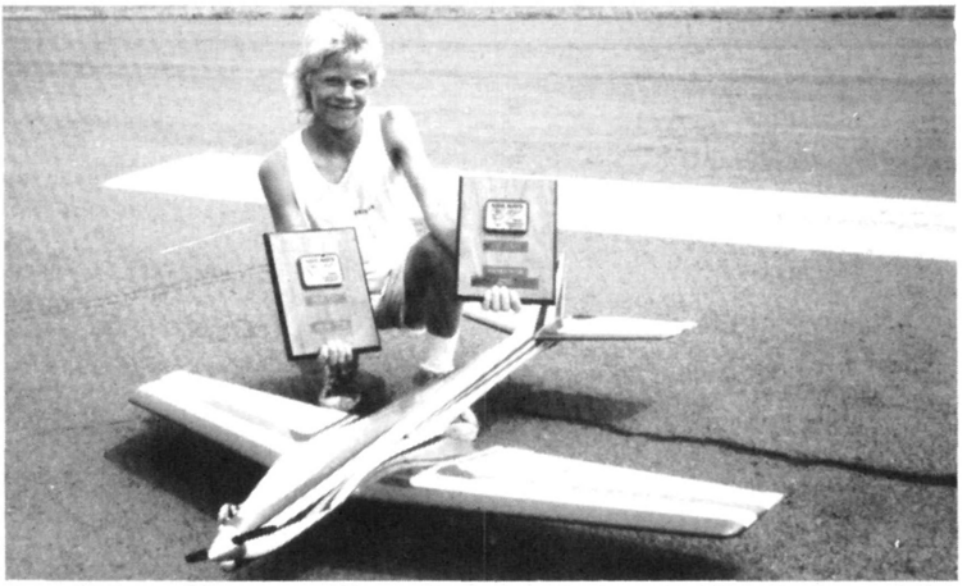
Pattern Matters

by MIKE LEE

I OPEN THIS month's column by telling you about a young reader and pilot, Jason Shulman, of Piscataway, NJ. Jason is shown with his Ten-Plus* Blue Angel aircraft and two plaques he won at the 1988 Nats in Tidewater, VA. One plaque was awarded for his 5th-place win in the Sportsman Class of Pattern; the other is his award for being the highest-placed junior contestant. Congratulations, Jason; well done!

Remember that these accomplishments are those of a junior member of the pattern fraternity. We've seen other juniors come up through the ranks and perform well: Rhett Miller was National Champ and World Team member before his 20th birthday, and so was Chip Hyde, who has only recently been entrusted with a driver's license. (Watch out for his low-flying Camaro!) Here we see American youngsters competitively entering model aviation, but, compared to a mere 30 years ago, we see so little of this. If you look closely at the three pilots mentioned above, you'll see that only one junior or senior member of the fraternity has come to the top in each of the last decades. If he continues to fly, Jason will probably be a force to reckon with in the 1990s, but this isn't *enough*. We need to *promote* our sport and hobby not only to our peers, but also to young people. They will be the future designers and competitors. They will help to shape the hobby and determine its ultimate well-being. They are our future. Do yourself a favor: Take a young person to the flying field and get him or her interested in a hobby that doesn't require drugs or chemicals to get them high. Model aviation is the biggest "high" possible—and you don't have to leave the earth. Thanks, Jason.

Shop talk this month deals with tuned pipes and some of their more peculiar aspects. I've discussed this subject before (see the Nov. '88 issue) and even explained in detail how the expansion chamber of the tuned pipe works. This time, let's delve a little into the things a tuned pipe *won't do*, or at least won't do very well.



Jason Shulman of Piscataway, NJ, proudly displays his plaques for 5th in Sportsman Pattern and High Point Junior Award at the 1988 Nats in Tidewater, VA. Jason flew this Ten-Plus Blue Angel, and, at age 14, is an example of youth in action.

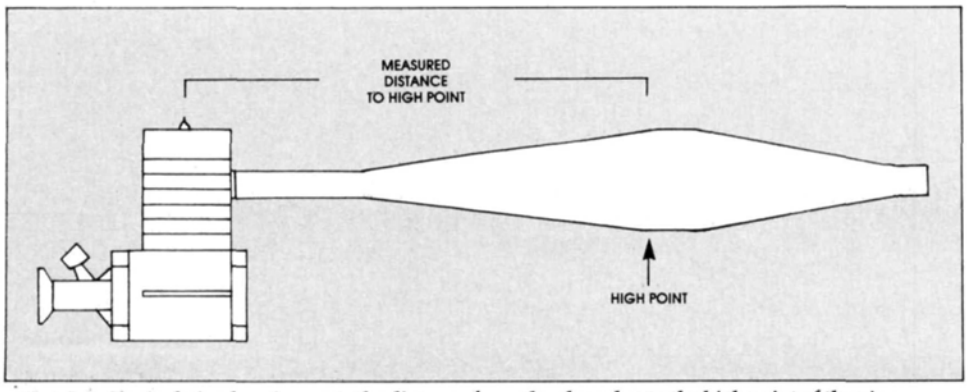
Many people think that a tuned pipe is a tuned pipe, and its shape or size doesn't really matter. Unfortunately, this isn't true. Tuned-pipe design is critical to the amount of boost obtained from the engine. Simply jabbing a pipe onto the rear of an engine may actually muffle the exhaust, but, getting one to *work* on the engine, which means getting that supercharging effect, takes more than a jab.

The amount of gas escaping from an engine and its exhaust port is directly associated with the size of the pipe chamber and the shape required to get a boost. I've discussed the pressure-wave effect that causes a super-dense charge of fuel to be shoved into the combustion chamber by the pipe. But, to take advantage of just the right pressure wave and density of the charge, the length and shape of the pipe must be such that the pressure wave is properly developed. Therefore, the following is true:

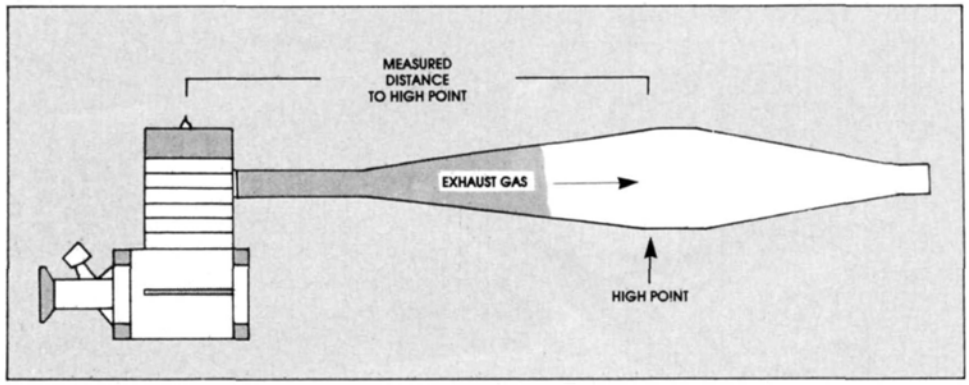
The chamber of the pipe must allow for proper expansion of the exhaust gases exiting from the pipe. The gases are still expanding as they exit the combustion chamber. On entering the pipes, the gases expand at a controlled rate to create an acceleration of the gases. This acceleration is fast enough to create a vacuum in the combustion chamber, thus pulling fresh air and fuel into and through the combustion chamber. It's actually pulled into the header portion of the exhaust.

At the same time, the expanding gases have entered the converging portion of the pipe chamber, where they decelerate and bounce off the rear of the chamber, because not all of it can escape from the small stinger of the pipe chamber. This is the pressure wave being formed. It backs up like a freeway jam, still expanding, and forces the fresh air and fuel in the header to be shoved back into the combustion chamber. This isn't so bad for the fuel, apart from the fact that the intake port is closed, and, since the fresh air and fuel are relatively cold, they can compress. The result is a super-dense air/fuel mixture that explodes with gusto in the combustion chamber.

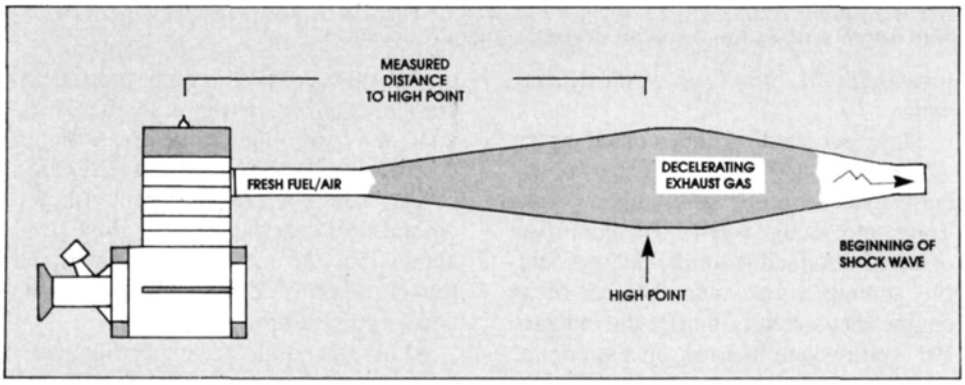
As you can see, this is all in the timing



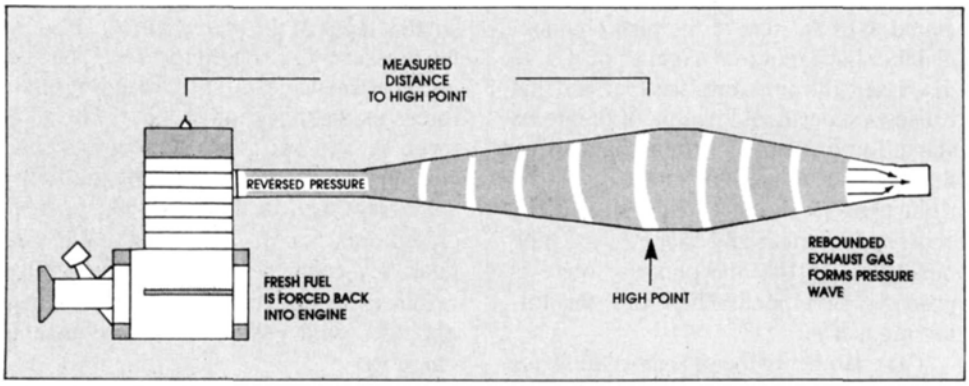
Sketch 1. Typical piped engine; note the distance from the glowplug to the high point of the pipe. This is the correct method of measurement.



Sketch 2. Exhaust gas has been ejected into the pipe and begins to accelerate through the pipe chamber. Gases will accelerate so rapidly that they will pull new fuel/air into the pipe.



Sketch 3. The exhaust gases have started to decelerate and this produces a rebounding shock wave. Meanwhile, a significant amount has been drawn into the pipe and the intake port has closed.



Sketch 4. Rebounding exhaust gas forces the new fuel/air back into the motor, producing a super-dense fuel/air mixture, which results in more power from the motor.

of this series of events, and it's dependent on the pipe length and shape. Case in point: My flying partner attempted to fire-up his new Aurora with a YS .60 engine up front, and it wouldn't get up on the pipe to save its life. We even enlisted Mr. "YS" himself, Steve Helms, to assist in coaxing the engine to life. No dice! After many hours of fooling around and guesswork, the answer was found by using a Rossi pipe coupled to the YS engine. The design of the Rossi pipe, though undoubtedly excellent, was unsuitable for the timing design of the YS. No timing, no boost, no performance. My partner switched to another pipe, and now there's no stopping the YS engine.

Here's another case that's obvious to long-time pipe users and control-line pilots in the speed category. The length of the pipe chamber dictates the rpm range of maximum useful boost and torque range. Control-line speed pilots know that to get maximum boost, you use a slightly shorter chamber that tapers more sharply as the desired rpm range increases. However, as the rpm range climbs, the range of boost becomes narrower and more critical.

As the chamber gets shorter, the rpm will increase; provided the engine is propped right, the fuel will burn fast enough (which is assisted with the nitro content), and the port timing of the engine is on the dot. But, the higher the rpm range, the narrower the range of effective boost obtained from the pipe.

Let's say we wanted maximum boost at 12000rpm, for an FAI ship turning a 12x11 prop. No sweat; we've seen that a good starting point is about 16.5 to 17 inches of pipe on 5 to 10 percent nitro. The speed enthusiast, however, wants 20000 to 22000rpm from his engine. His setting will be really short compared to our FAI ship—about 11 inches from plug to high point—and he'll be looking at 25-percent nitro fuel. The control-line speedster pilot is looking at 28000 to 30000rpm, and he's figuring a length of 9 inches (if that) and 45 percent nitro. Let me tell you, this second person will take an agonizing few laps in the circle just to get his ship on the pipe, and only if everything is absolutely correct. He has an error margin of about 2 percent, if he's to get his engine on the pipe. When the engine gets on the pipe, you really *know* it.

The usable rpm range and torque in our ships is pretty broad. I like to see an engine respond to power commands be-

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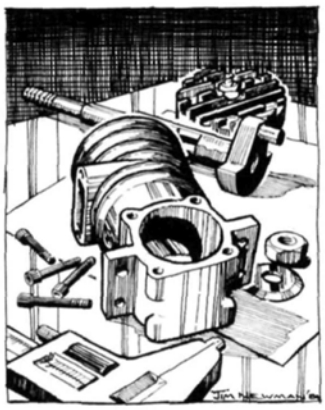


About Those Eng

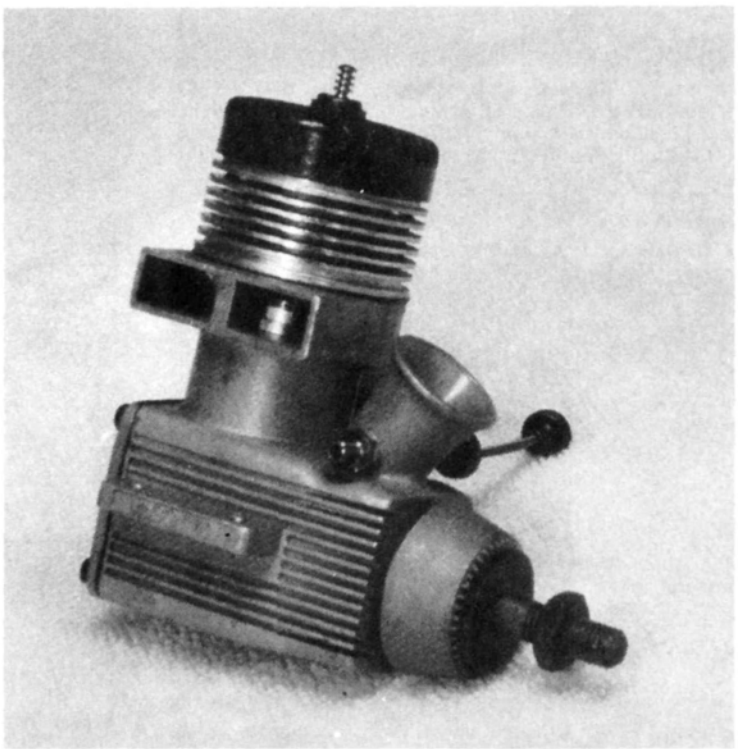
by JOE WAGNER

SOME MODEL ENGINE enthusiasts do nothing with their motors but collect them, restore them to their original condition, and put them on display. But *most* of us *use* our engines to propel model airplanes. Power output, throttle response, and dependability are the characteristics in which we're most interested. Sometimes, we buy a motor just because it *looks* intriguing: e.g., a Wankel, or a G-Mark Twin or a Technopower radial. However, when it comes to powering our R/C models for weekend flights or competitions, we stay pretty much with the tried-and-true single-cylinder two-cycle engines the designs of which have been refined and perfected for over half a century.

With all that experimentation and development behind them, you'd expect model airplane motors to be just about *perfect* by this time, and most are very good. Still, we model fliers do come across a dud engine once in a while, or we get one that's merely mediocre in output, while an apparently identical motor in a buddy's airplane performs flawlessly.

The main reason for discrepancies like these is *manufacturing tolerances*. The components of model engines are very precisely made and "true," but a given batch of pistons, say, won't be identical. Cutting tools wear; lathe spindles have running clearances; milling-machine feed mechanisms might not return to exactly the same starting position for each new piece; and a fleck of dirt or a tiny chip of metal can cause a part to be gripped slightly off-center in its holding collet. Even with the very latest, computerized, numerically controlled (CNC) manufacturing equipment, there are far too many variables in metal-cutting operations for model engine parts to be made absolutely perfect.

Economy enters the picture as well. The more leeway that's allowed in metal machining, the fewer the parts that must be scrapped—thrown in the trash because they don't meet specifications. It's always less expensive to relax the requirements a little than to reject everything that's less than perfect.



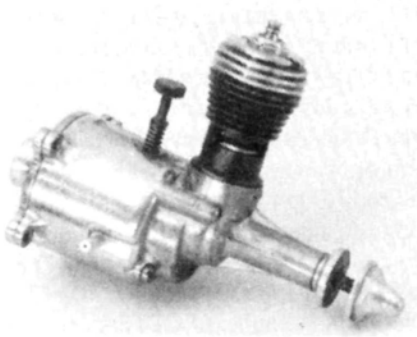
Last of the once-famous McCoy line of motors, this model was plagued with tolerance build-up problems. Hardly any of these performed well.

I'm not implying that model engine components are sloppily made to reduce costs. Obviously, they're not. But dimensional variations are normal. It's standard practice to allow a thousandth of an inch or so one way or the other on the length of a piston skirt or the distance between hole centers on a connecting rod. Even critical dimensions, such as cylinder bores or crankshaft diameters, have some size tolerance, though it's measured in microns (.00004 inch) rather than thousandths of an inch.

Singly, these minor variations in engine parts have only a negligible effect; the problems appear when the motor is assembled. The tolerances of the individual components usually cancel out one another, with a "plus" tolerance on one part compensated for by a "minus" on another. But a motor *can* get built-up once in a while by parts whose tolerances accumulate adversely.

This was more of a problem in the good old days, when, to ensure acceptability, most model engine makers test-ran every motor before selling it. The duds went back to the assembly department for rebuilding. Even so, the quality of model motors varied considerably at that time. The jobs of reworking and "hopping-up" stock motors were then almost as common as the task of wing covering.

Really bad specimens are seldom found among today's model engines. The high-precision, automated machine tools used in their manufacture require very little in the way of dimensional allowances. Still, two motors of exactly the same make and



First of the Cox 1/2A motors, this 1952 Space Bug was the first model engine made with sufficient precision to eliminate selective assembly.

model can perform quite differently.

The competitors who fly in the 1/2A Texaco R/C events have known this for a long time. They've found that by patiently trying various combinations of parts from a dozen or so stock Cox Black Widow engines, they can come up with one motor that performs exceptionally well. These people make no *changes* to any component; the event's rules specify *unmodified* Cox reed-valve .049 engines as the *only* acceptable power. Their secret lies in finding (mostly by trial and error) the optimum combination of engine parts, where the dimensional-tolerance stack-up is as favorable as possible.

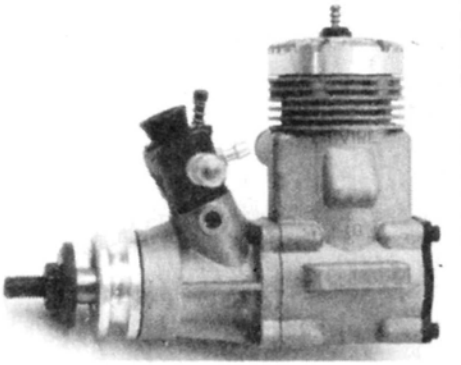
For some people, no trouble is too much for the sake of winning trophies. However, we fly-for-the-fun-of-it types usually lack the time, money, and ambition to build optimized engines by parts-swapping. However, there *is* a way of improving engine performance that's not too difficult or time-consuming: careful running-in.

I've already written about engine break-in procedures in this column. Last year, Alan Carter—a highly experienced Canadian modeler and professional engineer—decided to make a careful test of my recommended long, slow running-in process on no less than ten .15-size model racing engines.

Alan tells me: "These were Cox 'Conquests,' Rossis, Cox-Rossi hybrids, plus an MVVS—all with steel/iron cylinder/piston units. Following your instructions, I went to extreme prop sizes, starting with a 14x4 (although some motors wouldn't run consistently enough on that size to put any substantial time on them). However, I ran them all on 12x4 wooden props, followed by 10x4, 9x4, and 8x4. I used 3:1 fuel and put about 2 hours on each engine with each propeller.

"The results were interesting, but not startling. None of my engines turned out to be truly exceptional (when checked with my standard 7x2.75 fiberglass prop), but they were all noticeably better than average when compared with other motors of mine.

"What I find most interesting, though, is that the motors were all very similar in performance at the end of running-in. They didn't show the performance variations that usually appear between examples of the same make/model engines. In three test motors, I also noticed unevenly polished areas on their pistons, indicating imperfectly shaped pistons or cylinders. However, these motors ran just as well as those with pistons that looked perfect.



Typical of snugly fitted British model engines, this Irvine .40 was far too stiff to hand-start when new. After over 4 hours of slow break-in, it freed-up nicely and now starts with a few flips.

"To summarize: Significant benefits result from a long, slow run-in period, and it also enables the below-average motor to improve and become a better-than-

(Continued on page 119)

ELECTRILITER

(Continued from page 73)

Higginsville, MO 64037.

Black Baron; distributed by Coverite, 420 Babylon Rd., Horsham, PA 19044. ■

SMALL STEPS

(Continued from page 22)

result: My candidate lost, and I found myself with two *identical*, instead of symmetrical, fuselage sides. The moral is: If you want opposite sides, vote for the opposition!

"As temperatures are way up in the 90s, and I find it just too hot to move about, I've set up a table in the shade of a fir tree and I got down to repairing and giving a general face-lift to a very, very old Bill Northrop Apprentice, built some 20 years ago from a *MAN* plan, and still going strong, despite two wire fences, half-a-dozen trees and wearing out two O.S. 25s."

Notice how Paul exhibited concern for my wife with reference to my spare time? His service with the RAF obviously didn't degrade in any way his French birthright as a *coquelauch des dames*.

Another thing: What do you make of a guy who builds his chalet on the side of a hill so he can slope-soar from the front

(Continued on page 103)

FIRST ANNUAL M.A.N. SMALL STEPS FLY IN

In spite of the weather, this "small" gathering was a "huge" success!

by JOE WAGNER

I DROVE 1,300 miles—600 of them through rain and high winds—to get to Dallas, TX, for the very first event held strictly for small R/C model airplanes. It was well worth the trip! Not the usual sort of contest for R/C models, this meet was intended solely for enjoying the fun of flying smaller-than-usual R/C airplanes.

Held November 5 and 6, 1988, and sponsored by the Dallas R/C Club and *MAN*, the meet attracted entrants from as far away as Kansas City, KS, and Little Rock, AR. More fliers would have attended had the weather been better. High winds on Saturday forced an early afternoon shutdown, and some contestants, such as the Little Rock contingent, returned home discouraged, as the high winds were expected to continue through Sunday.

But Sunday's weather turned out to be ideal, with clear skies and gentle breezes—a perfect day for flying truly miniature R/C models, of which there were several. The smallest model was Jim Simpson's (from Sanger, TX) 13-inch-span Piper-like N-3 Pup, powered by a Cox .010. Tom Blakeney (from Fort Worth, TX) flew some notably tiny airplanes: a CAP 21, a Dalotel, and a Schweizer 1-30, powered by engines such as the G-Mark .030 and Cox Tee Dee .020. These were fantastic fliers for their miniscule size, and they impressed everyone.

A majority of the Fly-In entries had Cox .049-.051 motors—a total of 20 airplanes. Next in popularity were the .20- and .25-engine models, with a dozen examples entered. Only a handful of electrics appeared, probably because of the first day's high wind that most thought would keep up all weekend. I was surprised that there were only three .10-class engines at this meet—a poor showing, indeed, for a most useful size of powerplant for small R/C models.

Every type of R/C airplane was seen at the Fly-In, except multi-engines. Tom Blakeney even had a tiny biplane flying boat, which performed nicely on Sunday, despite having been blown end-over-end by Saturday's gale. There were trainers, old-timers, aerobatic models, scale airplanes of many varieties, a "flying wing," plenty of colorful biplanes and graceful long-winged soaring mono-planes. There were ARFs, kit models, airplanes built from magazine plans, and original designs galore.

Pioneer modeler Johnny Clemens (an AMA president and vice-president for many years) attended the meet on Sunday. Gene Hempel (District VIII candidate for AMA V. P.) was also there. So was Randy

(Continued on page 95)

***Clockwise from above:** A beautifully built Stampe SV-1 powered with an O.S. .20, by Ernie Harwood, from Arlington, TX.*

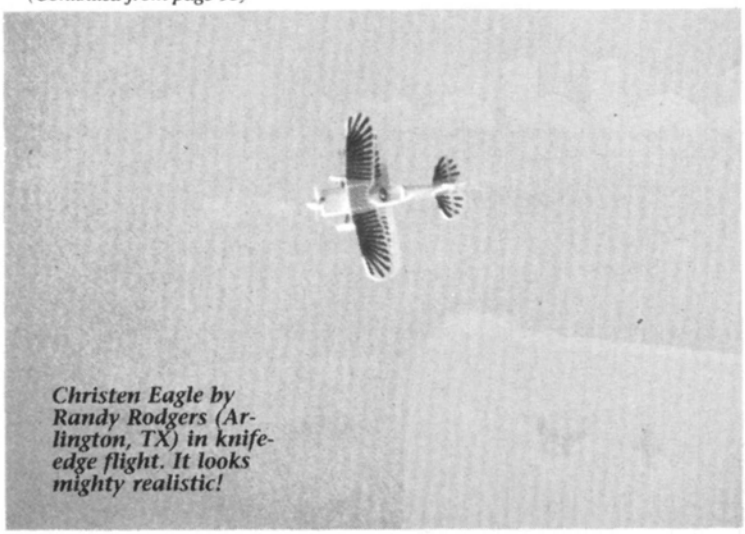
John Gill's original design is hauled aloft by a .25 FSR, and it performs as well as it looks.

Originally an old-time free-flight design, this .15-powered Quaker 54 flies slowly and sedately.

Suzi Williams (CD Eddie Williams' daughter) with John Gill's Sorta P-40. The costumed bear is Suzi's creation (but he didn't fly!).

SMALL STEPS FLY-IN

(Continued from page 93)



Christen Eagle by Randy Rodgers (Arlington, TX) in knife-edge flight. It looks mighty realistic!

Randolph, of course, and a couple of old-time Texan modelers I hadn't seen since the 1950s. I ended up doing far more *talking* than flying!

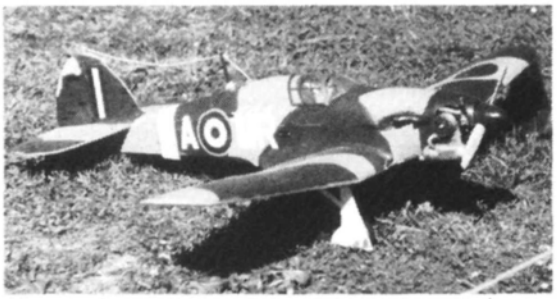
All who attended the Dallas Fly-In enjoyed its informal, low-key atmosphere and the style of flying that prevailed. The entrants flew for their own personal satisfaction, not to conform to somebody else's schedule of maneuvers or pre-determined flight pattern. No trophies or other prizes were at stake; each entrant received a "Survival Certificate" suitable for framing and a souvenir issue of *MAN*. As far as I could tell, nobody missed the glittering hardware. We were there to have a good time—and that's just what we did.

Contest Director Eddie Williams and his devoted band of helpers did a superb job of running things. All in all, this First Annual Small Steps Fly-In was a big success, and I'll be glad to drive the 1,300 miles again to attend the next one! ■

Typical scene in the pit area. Saturday's gale almost blew away the steel-framed sun canopy!

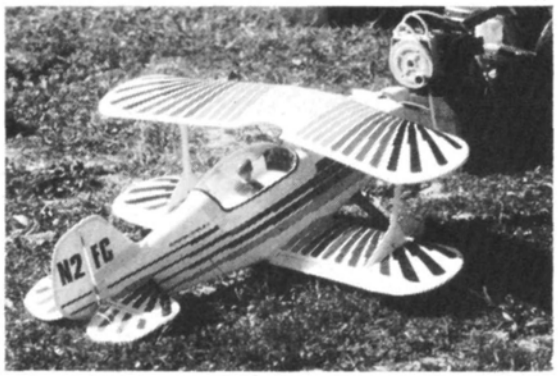
Two of Randy Randolph's designs: Wes Moore's Hugger up front and Randy's own G-Man in back.

***Below:** Another marvelous miniature by Blakeney, the CAP 21: TD .020 power, 3 channels—and 50mAh Ni-Cds!*



Hawker Hurricane scale model by John Westbrook (Little Rock, AR) has an O.S. .25 in its cowling.

***Below:** A modified version of one of Ken Willard's designs, this tiny flying boat flew beautifully.*



This O.S. .25-engined Christen Eagle was somewhat heavy, but it flew impressively.

Golden Age

by HAL "PAPPY" deBOLT

LAST MONTH, I wanted to discuss the Sampey systems, but I ran out of space, so I'll quickly get to it this time, and again, I'm indebted to Dr. Shabot for photos of his 404.

The Sampey system was like a shooting star in the R/C heavens: One moment there was nothing; then there was this brilliant product and its noteworthy accomplishments, followed by a rather quick dive to obscurity. Fame was achieved when Maynard Hill used a Sampey 404 to establish one of his early altitude records. At about the same time, someone apparently used a 404 to win the Nats (according to Sampey ads). Again (as with many of these bygone systems), I'm short of detailed information, but from Allen Knight, I have Sampey literature to glean details from.

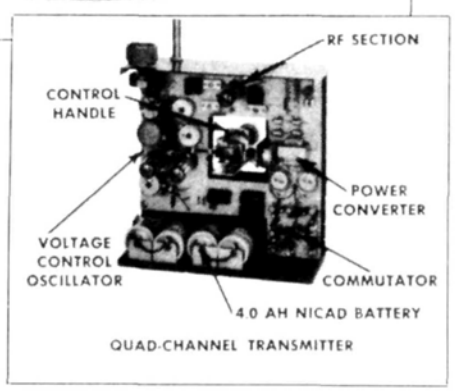
The Sampey was a complex, propo, multi-channel concept that involved much high-cost development time. It used analog coding at a time when digital was arriving on the scene (probably around the time of the Quadruplex analog).

First, the Sampey offering reflected the overlap that was seen in radio development. We'd just get acquainted with one type, when something else arrived. Often, you felt safer with something that you *already* knew how to use—in spite of claims of superiority by manufacturers of alternative products. At the time, super regenerative receivers were in widespread use, and the vastly superior, super heterodyne circuits were just proving their worth. Sampey apparently wanted to cover all bases; you could have the 404 as a super-regen or superhet! Very unusual!

Dr. Shabot mentioned that an OT friend once told him that a popular nickname for the Sampey radio was "swampy"! Swamping *was* a characteristic of early radios, and we don't see this today. If you placed the TX antenna too close to the RX antenna, some systems became inoperative. I'm thankful that in normal use, the condition wouldn't appear, and its cause was simple. When was the last time you were concerned about in-flight range? Probably never, right? However, range was a major factor with early radios; many commonplace "flyaways" were the result of flying out of range (an eerie experience!). Often, when the end of range was reached, you asked for a turn and had no response, and then the model circled by itself. On completing 360 degrees, it would sometimes be close enough for you to catch about one command again. The trick was to have that command opposite to the natural circle so that it would head the model back toward you. Also, the golden rule was always to fly "upwind" in the hope that the wind would carry the out-of-range model back toward the transmitter. What a joyous feeling it always was to get that high-and-away model back under control! But often you didn't, and a mad car chase was on, as you tried to follow the flyaway! Early R/C flying was so exciting in so many ways!

To maximize range, early receivers were designed to be ultrasensitive and able to respond to the weakest signal; a side

Sampey 404 full-house analog proportional system of the mid '60s. Produced in Orlando, FL. Note "inner workings." System cost $498 then. Details in text.



Alex Lekon's very successful Demon design. Arden .09-powered; Control Research single-channel radio equipment.

Alex Lekon showed the way to reliable R/C in Cleveland area during '50s.

Beacon Electronics' version of Dr. Good's single-channel system, 1947 era. Note roll of TV antenna wire used for TX dipole antenna.

effect of this was "swamping." As the name implies, if the signal was too strong (as with close antennas) the sensitive receiver would be overpowered (swamped) and thus paralyzed. Automatic-gain control (AGC) was a major step forward in receiver circuit design. (This stage comes right after the detector circuit.)

In effect, AGC is a combination amplifier and clipper. As such, no matter how weak the signal received, when it passes through the AGC section, it exits at an established, usable level for decoding. An extra-strong signal would be "clipped" down to the established level, and the result was that no matter what the strength of the received signal, the decoder section *always* saw the same amplitude signal, so ensuring a precise decoder.

At Sampey's time, AGC was apparently still a new kid on the block, and Sampey wasn't convinced of its value; hence, his systems were "swampy." With other brands of analog systems already developed, Sampey had knowledge to draw on, and this is reflected in his approach to meeting R/C needs.

Unlike Space Control, but similar to the Quadruplex CL-5, the Sampey 404 used four analog channels. Audio-frequency neutrals were 1200, 1800, 2600 and 3600cps, and the transmitter still used three tubes complemented by eight transistors. Unusual was the 4.8V power supply when most others used double that amount. A photo shows a very sophisticated TX circuit-board layout contrasting with what was considered to be unreliable battery holders. A typical case of 98 percent great plus one weak link? In keeping with the analog trend, the 404 TX was single stick plus separate trims on all fundamental functions.

Sampey apparently produced his own closed-loop, feedback-style servos. I have no info on the motor, gearing, etc., but the outstanding feature was said to be the use of an additional transistor in the amplifier circuit for temperature compensation. Temperature drift was a serious consideration with most early radios.

The receiver completed the airborne package and, unlike others, the Sampey servos were individual units, each with its own receiver-connector cable à la the reed systems. (No sign of the "red brick" concept here!)

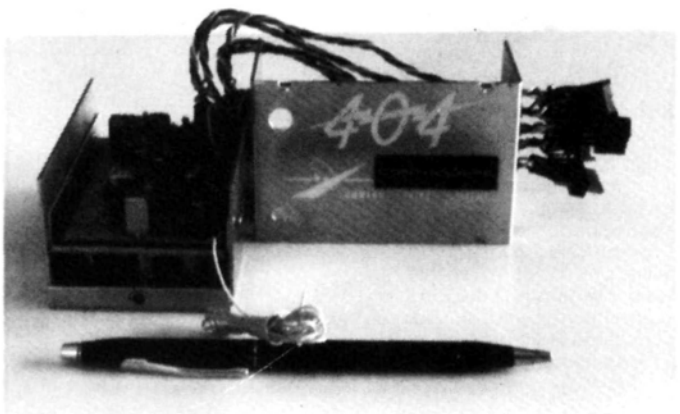
An excellent comparison with today's equipment is the 404 receiver. It was big: $1^5/_8$x2x3 inches, weighing 6.5 ounces! Typically, a modern receiver would be about a quarter of that size! At 6 volts, the power needed was also unusual. With individual servo cables, the receiver had the required "pig tails"—again, à la reeds for connection. Today's "multi-connector" blocks had yet to come!

In its short lifespan, the Sampey 404 was the talk of the town, and many admired its features. Its demise can be related to some reliability problems and to the arrival of the simple digital concept.

Less well-known was the Sampey Starlite 200 system, which was apparently aimed at the still-widespread single-channel market. This one appeared *after* the 404 and was apparently an attempt to broaden Sampey's product base. In tune with the times, the Starlite 200 was offered in both *kit form* and as a completed system.

Initially, early radio equipment was home-built by enthusiasts who often used their own designs or, at best, had only schematics to follow. This probably partly accounts for the limited interest in R/C at the time; you needed electronics ability *plus* modeling know-how! The Good Bros. are an excellent example: Walt the airplane flier and Bill the "sparks" man. Increased growth came when kits with ample instructions arrived on the market, and the Berkeley Aerotrol did much in this respect. Ace R/C also started with parts and kits, and today it's about the only remaining source for electronics tinkerers. So, with the Starlite 200, Sampey was

(Continued on page 122)



Sampey 404 receiver. Note multitude of "pig-tail" connectors. Hole in cover for RF tuning. Photos by Dr. M. Shabot.

Sporty Scale Techniques

by FRANK TIANO

Carol Tiano holds Bob Violett's F-86F; painted aluminum finish.

ONE OF THE TOPICS I discuss this month is a technique to duplicate an aluminum finish on a scale, model aircraft. Before you say you already know that the *only* way to get a real, "el primo" finish is by using some sort of *real* metal covering, i.e., printer's plate or aluminum air-conditioning tape, let me tell you that I think I might have come up with an easier alternative.

One concern about a metal finish is "What will the judges do at a contest if I don't provide a *real* metal skin?" (Until now, I thought that the contestant should receive a slight downgrading.) To borrow a friend's thought: "If you gave someone a 10 for an outstanding simulated-aluminum finish, what would you give someone who used *real* metal—an 11? Well, until yesterday I really subscribed to that train of thought. Then I started thinking about all the 11s that would have to be handed out in a 10-point category if this were made a rule. For instance, would your outline score be better if you had *functional* exhausts?; would *real* rivets earn you a higher score than simulations?; should you sheet your model and leave *real* gaps between the surfaces to provide real panel lines?; and last, but not least, is it a good idea to drag the completed model around through the swamp and woods to create a *real* weathered finish? Absurd? Of course, you say. I agree; it may be a bit off-the-wall, but do you see the overall picture?

It doesn't make any difference whether you *compete* with your scale model or just bring it to the local field for your share of the "wows," we're all primarily creating an illusion. We try our darndest to make something look like something it really isn't; right? We color our finished airplanes to show powder burns in the gun areas; we darken the fuselage to indicate exhaust streaks; we shade certain areas to give depth; we use elastic thread for radio antenna wire; we cover our simple landing-gear struts with plastic or wooden pieces to give them a realistic appearance; and we do anything humanly possible to create this grand illusion—all to make a more realistic model. Am I making a little more sense? If this is so, why does one particular color or finish come under scrutiny?

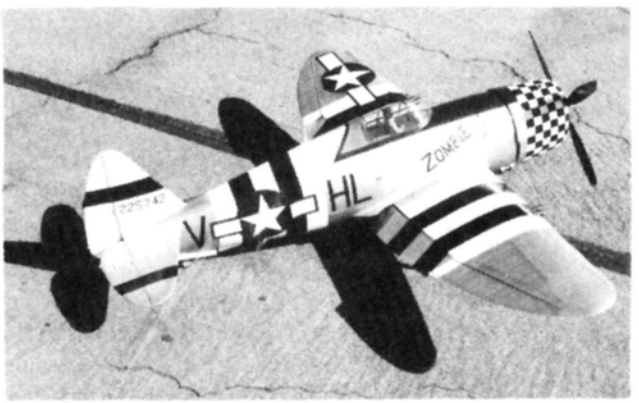
With this in mind, let's go on. There are two major types of natural aluminum finish that we can duplicate: One is the polished mirror-like surface that you see on show-quality T-6s, Ryan PT-22s, some civilian aircraft and some really righteous Mustangs. The other type of natural metal finish is the one seen at the local airport on most general-service aircraft; the one seen on most P-51s at airshows; the one seen on most Texans and the one you would have seen in the skies over Europe during most of WW II. This is the flat, scarred, non-glitzy, almost grey-colored finish that many of us try so hard to create with pieces of metal tape that we then burnish to achieve the desired effect.

For the first type, the mirror finish, there are three ways to go: You can sheet the entire model with *real* aluminum and then buff your 75-pound wonder into oblivion; you can sheet the model with the new $^{1}/_{128}$-inch-thick flexible mirrors offered by

Dr. Bill McCallie's Ortega FW-190D9; 72-inch-span; O.S. 108; 15 pounds. Soon to be re-released.

Natural aluminum Douglas A-26—can't exactly shave in the finish like a mirror; compare with photos of models.

Chuck Fuller's scratch T-6 (not Ziroli). Chrome MonoKote applied in panels. Excellent, realistic portrayal of polished aluminum!



Shane Cramer's Baker P-47D; painted finish; bit overweathered.

K-Mart; or you can follow Chuck Fuller's recommendations and use chrome MonoKote, both in iron-on and stick-on versions. Properly applied, I really don't think you'll find a more realistic-looking polished-aluminum finish, and best of all, it weighs only 1/400 that of K-Mart glass sheets! It isn't easy to apply, but obviously, it can be done, and after an effort like that I, for one, don't think a plane should be downgraded. In fact, for a perfect job, I think *maximum* points should be allowed. Remember, the objective is to create an illusion of a full-size aircraft's surface, using whatever materials you prefer.

For the other type of aluminum—the dull version—you can go the metal-tape route, use printer's plate and contact cement, or you can try your hand at painting. I'm not going to recommend a method of painting this type of finish, although I *have* found a method that works well. Instead, I'll allow you, the scale builder, to write in describing the methods you've used, and I'll offer them in a future column. Should be kinda interesting!

What's New in Kits

For some reason, the model airplane industry hasn't offered any new *scale* kits over the past few years. Yes, I know that we can find many plans and that we can buy a slew of fun scale, or "stand-across-the-street" (S.A.S.S.) scale models, but the scale modeler who would like to go that extra step pretty much has to stay with the designs that have been around for some time. Armed with this knowledge, I was all set to give a 10-minute dissertation on how we, the scale buffs, need a new release now and then. However, just as I was about to strike the first key of the typewriter, I heard information from various spies throughout the country. Call them rumors if you like, but if they turn out to be true, remember that you saw it here first.

A few years ago, previous Scale Masters contestant Jerry Ortega designed a beautiful long-nosed Focke Wulf 190. The exact designation of this "Pinnochio" version was the FW-190D9, or "Dora" as Field Marshal Von Rattner so affectionately called it! Anyway, after producing only a few kits of this remarkable model, Jerry sold the rights, along with a couple of other designs, to a well-known kit manufacturer in the Midwest. This company sort of kept things on the back burner for a while and never released the D9, although I think the sales would have been very good. Recently, a new, upcoming kit company

SPORTY SCALE

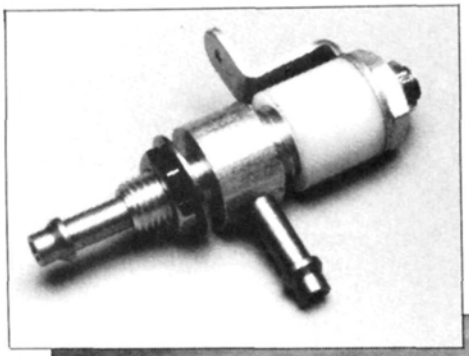
has purchased the D9 molds and several other scale, kit designs, and before long, will be producing them. Watch *MAN* for the ads. Also in the works is an incredible 88-inch Skyraider from a small Californian company, a 65-inch Raider from a Midwestern group and a gorgeous new 100-inch P-38 from a small company in the Virginia area. Recently released were the F/A-18 by Yellow Aircraft* and the Super Scale F-86 by Bob Violett Models*. I'll keep you posted as I hear more confirmations.

Last, but not least, this month, I'll show you a neat contraption that should make your scale models last a little longer. It's something that can help you avoid crashing because of an over-lean engine coupled with a sprinkle of disorientation! It's a new 75-pound anchor offered by Rich Uravitch Models that absolutely *prevents* you from taking off in the first place! Just kidding! It's actually a remote "air-adjustable" needle valve that's recently been released from Jet Model Products*, which is owned and operated by Tom Cook, a past Masters winner, all-around swell guy and jet-jockey extraordinaire!

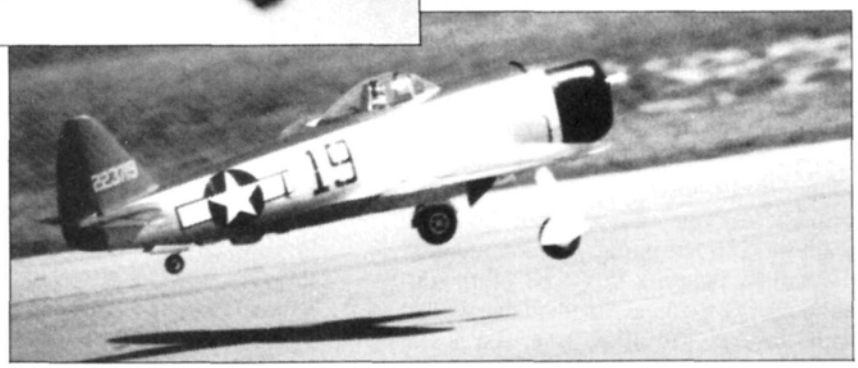
This needle valve can be mounted somewhere other than on the engine and then operated via an additional small servo. For that matter, you could use an additional *big* servo! It gives added insurance against a heart attack. Even though we all know that we should *never* take off with a lean engine, Mr. Murphy sometimes dictates that we do this anyway, and we usually suffer the consequences that a now-overheated, lean engine can bring. With Tom's device, at the first hint of a lean engine, you simply adjust the appropriate transmitter control to richen the needle valve, and this allows you to keep on truckin'—or flying—depending on the state of your altitude when you first discovered the lean engine! The unit retails for $25 and can be used on any R/C vehicle equipped with a glow engine. No, it can't be used on electrics; Tom says that the orifice is too small for the electrons to pass through at the same time as the ohms.

Trivia question of the month: What comic-book character had the first stealth aircraft in its repertoire of kinky stuff?

Before closing, I hafta say one more thing! To all those scale enthusiasts out there who have been erroneously checking their fours, it's another 60 degrees to the right! Until next time, join the ranks and likes of Tiano, Ziroli and Uravitch... and check your six.



Jet Model Products remote needle-valve assembly. Universal application.



Bob Olson's Scale Flight P-47; painted finish.

**Here are the addresses of the manufacturers mentioned in this article:*

Yellow Aircraft & Hobby Supplies, Ltd., Suite 201, 3040 Palston Rd., Mississauga, Ontario, Canada L4Y Z26.

Bob Violett Models, 1373 Citrus Road, Winter Spring, FL 32708.

Jet Model Products, 304 Silvertop, Raymore, MO 64083. ■

SMALL STEPS

(Continued from page 90)

porch and not have to buy glow fuel?

The gentleman in picture No. 3 is Gene Hempel, who's running for AMA Vice-President in the VIII District. If he's elected, we'll have a "small engine" man on the Council. Gene has done a lot of

Gene Hempel checks out the G-Mark .061 in author's GeeHaw.

work with Cox .049 engines and is considered to be one of the best at improving their performance. The airplane, which is due for publication in "FM," is powered by a G-Mark .061 that snatches it around very well, thank you!

Picture No. 4, the Twiliter II, is many things to many people. This conversion is a logical one, because the landing gear makes it a much better trainer. This way, the student can practice more than one landing per flight! Large 4-inch wooden wheels with rubber "tires" from a bicycle inner tube enable it to fly from unimproved fields. A simple torsion-gear mount is added to the bottom of the fuselage just below the wing leading edge.

Until next time, keep taking those "small steps," and keep writing to tell me about it! ■

FLOATING AROUND

(Continued from page 61)

Ontario, Canada. They had a windy Saturday but a calm Sunday, and float fliers showed up from over 100 miles away. One of the Peterborough shots is of Don Deyell's Pilot Super Cub from Hobby Shack*. A while back, I made a resolution to stop showing Cubs, to illustrate how almost *any* plane can be adapted to floats and *not* just Cubs. However, when I saw Deyell's Cub with scale EDO Floats, I buckled; it's a beautiful job.

The other Cub is by Bill Curry, and I included it because it has been painted differently (kudos to Bill). Why do those who own full-scale planes get to paint them any way they please, while we have to exactly "model" what *they* do? (Just asking!) The other photo shows Tyrone Parker with his mica-film-covered scratch-built floatplane. The photo came from Ed Westwood, with the information that the plane weighs 3 pounds and is powered by an HB21. Ed comments that Tyrone's plane is a *super* flier, and I believe it. Maybe we can talk Tyrone into doing a construction article for *MAN?*

Craig Dean's O.S. 10-powered Berkeley Navigator flew at the Ontario, Canada, "Splash Bash."

One more comment on the photos: I'm not sure where you could get plans for Craig Dean's Berkeley Navigator, but I think I remember seeing them available from Bill Effinger's W.E. Technical Services*.

By the next column, I hope to have a report on Karl Tull's Quadra-powered Dornier Amphibian, a Havasu Schneider Race update, and more floatplanes and tips. I hope I haven't left you with the impression that Ronnie Bush is a party

(Continued on page 106)

Product News

LEISURE ELECTRONICS 05/075 GEARBOX

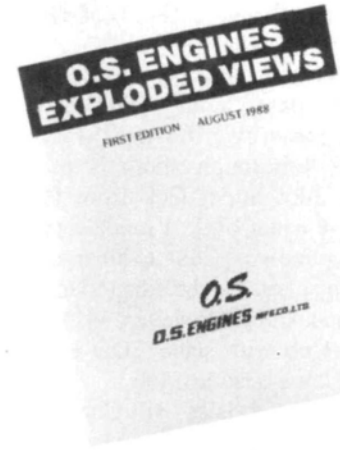
Nose-overs can be deadly to the shafts and gearboxes on electric drive units. To help prevent this kind of damage, Leisure Electronics has introduced a new, stronger gearbox. Three-sixteenths-inch hardened-steel shafts replace the older 1/8-inch units, and larger 3/16X3/8-inch ball bearings support the main gear. The new DuPont plastic used in the gears reduces the likelihood of stripped gear teeth. This new gearbox is standard on all new Leisure 05 motors and can be retrofitted to older types. The units are adaptable to all motors in the 05 to 075 range.

For more information, contact Leisure Electronics, Inc., 22971 Trinton Way, Unit B, Laguna Hills, CA 92653.

RJL INDUSTRIES COX CONQUEST .15 R/C

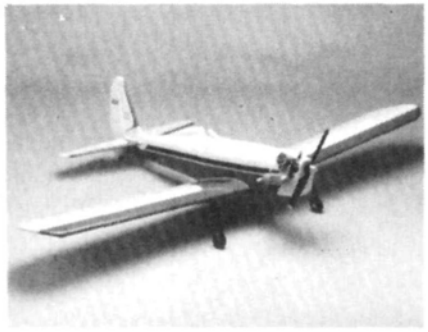
RJL Industries recently purchased the Cox Conquest .15 engine line from K&B Manufacturing. The Conquest .15 is well-known for its extremely high power output and quality construction. Its features include: Schnuerle porting, rear exhaust with side-exit muffler, double ball bearings and lapped piston/cylinder assembly. Like all RJL engines, the Conquest .15 is entirely produced in the USA on the latest computer-controlled machinery.

For more information, contact RJL Industries, Inc., P.O. Box 5, Sierra Madre, CA 91024.



GREAT PLANES O.S. ENGINES BOOK

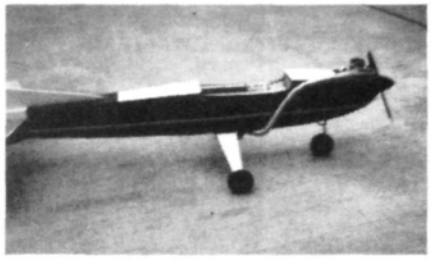
The premier edition of the O.S. Engines Exploded Views Book will be an invaluable troubleshooting aid and engine reference. This book contains diagrams of 91 O.S. engines, including the entire FS, FSR, and Surpass lines and most specialty engines. Parts identification is greatly enhanced with this manual.



O.S. RYAN ARF

A 90-percent-complete Ryan is O.S.'s entry into the ARF market. It features an inner balsa construction wing with a specially designed four-layer covering that's both durable and beautiful. The Ryan also comes with most of the necessary hardware to get you into the air quickly. It even comes with an O.S. .40 FP engine already installed.

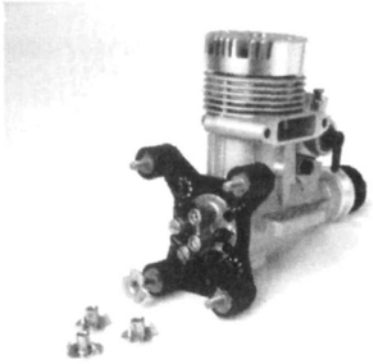
For more information, contact Great Planes Model Distributors, P.O. Box 4021, Champaign, IL 61820.



JACKSON MFG. FLEXIBLE EXHAUST

This lightweight flexible tube directs messy oil away from your airplane. It can be fitted to any model by bending it to the shape you want. A close fit to the fuse is obtained by using a unique method of joining them with epoxy and wrapping the pipe down under the fuse. This flexible tubing comes in 3-foot lengths.

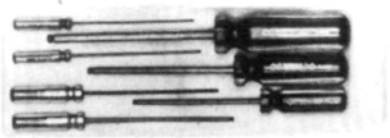
For more information, contact Jackson Mfg. Co., R.R. 2, Box 81D, Edgeley, ND 58433.



PLANES AND THINGS FLEX MOUNT 60

Planes and Things introduces the Flex Mount 60, a vibration-absorbing motor-mount system designed to isolate engine-related vibration from the airframe. The benefits of using this mount include a reduction in airframe-generated noise, an increase in radio-system reliability and increased structural lifespan. The mount will accept most 60-size front-intake engines. Universal design needs no drilling or machining. All hardware is included.

For more information, contact Planes and Things, 1226 E. Ave. J-12, Lancaster, CA 93535.



BONDHUS BALLDRIVERS

This high-quality hardened-steel driver set includes seven precision-sized drivers: 1.27mm, 1.5mm, 2mm, 2.5mm, 3mm, 4mm, and 5mm. Driver size is marked on each handle for easy identification. Balldriver tools come in a sturdy, reusable vinyl pouch and are also available in standard non-metric sizes.

For more information, contact Bondhus Corp., 1400 E. Broadway, Monticello, MN 55362.

ROBBE SCOUT 60 MODIFICATIONS

Modifications are necessary to fit the Scout 60 mechanics to existing scale fuselages, so Robbe Model Sports has put together a modification kit for just this purpose. The kit includes a fuel-tank-position offset modification for easier installation (tank mount No. S3112). This new position allows the use of Robbe's tuned silencer (No. S0924). These two improvements narrow the straight-on profile for easier acceptance of the Schluter .60-size fuselages. Other modification hardware includes glass-fiber-reinforced tail-rotor blades (S0394), new aerobatic flybar paddles (S3541), and new softer springs for the autorotation mechanism (S3461).

For more information, contact Robbe Model Sports, 180 Town Line Rd., Belle Mead, NJ 08502.

FOURMOST PRODUCTS SOLDER WASHERS

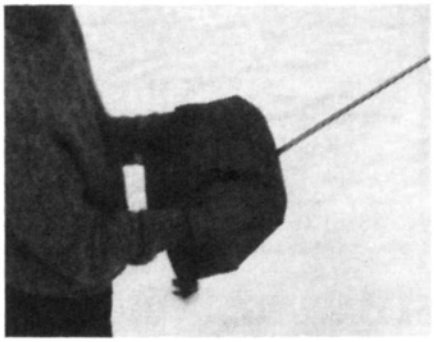
The Precision Solder Washers from Fourmost Products are a set of brass washers that have been punched with exactly .002 inch of i.d. clearance. This prevents the washer from flopping to one side, yet allows solder to flow through, so the result is a strong, neat joint. The washers may be used for landing gear, bearings, bellcranks, tail wheels, etc. Most common sizes for L.G. wire are 5/32 inch, 1/8 inch, 3/32 inch, and 1/16 inch.

For more information, contact Fourmost Products, 4040 24th Ave., Forest Grove, OR 97116.

FUTABA 5UAP/ 5-CHANNEL PCM 1024

Now you can have a 5-channel system with extra features like transmitter RF module, ATV, dual rate combined with Futaba's exclusive PCM 1024 for the ultimate in servo resolution and response.The 5UAP provides ATV adjusters for ailerons, elevator, throttle and rudder, dual rates for aileron and elevator and servo reversing on all channels. The 5UAP tuning panel lets you select PPM(FM) or PCM 1024 signal generation and pre-set failsafe.

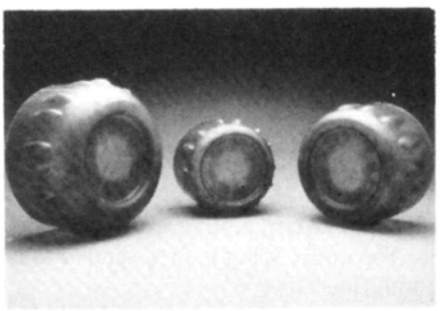
For more information, contact Futaba Corporation of America, 555 West Victoria St., Compton, CA 90220.



D.D. & D. TRANSMITT

The Transmitt lets you enjoy your R/C action in cold weather by keeping your hands warm without losing control sensitivity. Sleeping-bag-type construction provides excellent protection for your hands and transmitter. It comes in red, blue and yellow.

For more information, contact D.D.& D., 67659 29th St., Lawton, MI 49065.



FIBERGLASS MASTER ROUND COWLS

The already extensive line of fiberglass cowls, wheels pants and accessories has again been expanded to include a range of radial cowls with integrally molded rocker-arm "blisters." These are ideally suited to such "classic" airplanes as the Wacos and Stinsons of the Golden Age era and they're available in a variety of sizes.

For more information, contact Fiberglass Master, Rt. 1, Box 530, Goodview, VA 24095. ■

Descriptions of new products appearing in these pages were derived from press releases by the manufacturers and/or their advertising agencies. The information given here does not constitute endorsement by **Model Airplane News,** or guarantee product performance. When writing to the manufacturer about any product described here, be sure to mention that you read about it in **Model Airplane News.**

FLOATING AROUND

(Continued from page 103)

animal. Actually, he's a very stable person; sort of like Chris Chianelli or Rich Uravitch.

**Here are the addresses of the manufacturers mentioned in this article:*

Balsa USA, P.O. Box 164, Marinette, WI 54143.

O. S. Engines; distributed by Tower Hobbies, P.O. Box 778, 1608 Interstate Dr., Champaign, IL 61820.

Loctite Corp., 18731 Cranwood Park, Cleveland, OH 44128.

Hobby Shack, Inc., 18480 Bandilier Circle, Fountain Valley, CA 92728.

W.E. Technical Services, P.O. Box 76884, Atlanta, GA 30323. ■

SIG RISER 100

(Continued from page 75)

right panel, so completing wing construction. The entire wing is then sanded to a smooth finish.

Both the vertical and horizontal stabs are built directly over the plan and framed with 1/4x5/16-inch balsa; the geodetic ribs are made of 1/8x1/4-inch balsa. The elevators are cut out of 1/4x2-inch balsa sheet and joined with a 1/4-inch dowel. Both are sanded to a smooth finish.

• Covering: I covered the Riser 100 with Red MonoKote* and put a white stripe on the right outer wing panel. This white stripe helps with orientation at a distance and when making a long, low approach. The instruction booklet fully describes the way to achieve a two-tone finish, and this will help beginners.

• Final assembly: The wing rubber-band hold-down dowels are glued into place. (It's recommended that they be painted to match the fuselage.) Making sure that it's level with the wings, the stab is glued into place. Since the fuselage sides are 1/8-inch lite-ply and don't offer much gluing area, be sure to use a generous amount of epoxy. The vertical stabilizer (fin) is then glued into the slot at the rear of the fuselage and must be set at 90 degrees to the stab.

Using a No. 11 X-Acto blade, make slots for the Sig Easy Hinges in both the vertical and horizontal stabs and the control surfaces, then attach the supplied horns to the rudder and elevator.

The pushrods are made by screwing the wires into the plastic inner pushrod. (Use a clevis at the control surfaces and a Z-bend at the servo.) The servos are mounted on spruce rails with the elevator and rudder side by side, and the spoiler servo in front of these. The spoilers are hooked up with the supplied wire horns and dial cord. Weights are mounted to the underside of the spoilers to help them close completely. The tow hook is made from a 4-40 threaded rod that's bent, cut to length and mounted with a nut and a blind nut.

Finally, balance the model and check all surfaces for direction and recommended throws. I used 4 1/2 ounces of lead to balance the Riser, bringing the flying weight to 49 ounces for a wing loading of 7 ounces per square foot. Definitely in the floater class.

PERFORMANCE: The initial-trim flights were made on a calm day, and only slight trim adjustments were needed for straight and level flight. The following weekend, I introduced my wife, Mary, to the Riser 100, and I'll let her take over with her impressions of the new glider.

"The morning on which I was to try out the Riser was cool, cloudy, and very windy. The Riser was the first glider I'd flown in over four years, because motherhood interrupted my contest flying—I was too busy! I had found it very hard to concentrate on flying with two babies needing my attention, but now that they're four and two years old, I'm ready to fly again.

"John did a wonderful job of building

(Continued on page 108)

SIG RISER 100

(Continued from page 106)

and covering the Riser, and his encouragement gave me the confidence I needed to fly again. For my first flight, John launched the Riser, checked out the trim and then handed it over to me. I was surprised at how easy it was to fly smoothly and gracefully. It's a *very* stable model and makes good flat turns without elevator. I flew big circles without finding any lift, but I really enjoyed the beauty of it all.

"On approaching the ground, my heart beat faster as I worried about successfully landing this beautiful glider that John had spent so much time on. He told me that he was going to open the spoilers and that I should be ready to give some up-elevator. Having never used spoilers before, this really messed me up. The Riser's nose dropped and I didn't react fast enough, so I decided to hand the controls over to John for the landing.

"On the second flight, with more confidence, I knew I'd do better. This time, I took the Riser up, and the launch was straight and steady. The flight went well, and this time, I landed *without* spoilers. It wasn't the best of landings, but I brought the Riser down without crashing or hitting anything. I'd flown and landed by

(Continued on page 110)

SIG RISER 100

(Continued from page 108)

myself, and it felt great!

"On the third flight, we let a young boy who was just learning to fly try the Riser. He did so well, and enjoyed flying the Riser so much, that his father said he'd buy one for him as a Christmas present.

"I'm now ready to fly the Riser regularly and to get back into contest flying. I once flew in the Sportsman Class and think that the Riser will quickly get me right back into the swing of things. But I'll definitely have to practice with the spoilers!"

The only thing I'll add to Mary's assessment of the Riser's flight characteristics is a comment about its L/D and the spoilers. For an open-structure wing with turbulators, the L/D is fantastic; it just seems to keep going without losing altitude. This gives it excellent dead-air time and could be very helpful during contest flying.

The spoilers are very large and could be slightly narrower. A spoiler should help the model come down in a steady, controlled descent, but if the Riser's spoilers are fully opened, the model seems to be short on elevator. I'd therefore recom-

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SIG RISER 100

(Continued from page 110)

mend that they be set up to open only about 60 degrees.

Conclusion

When building the Riser 100, I followed the instructions and didn't make any modifications. The model is well-thought-out and will fly well if built stock. Like most models, it could be modified slightly to suit different flying styles. In its stock form, it does exactly what it was designed to do. It flies well and has the right handling characteristics to give novices a chance to develop their flying skills. More experienced pilots will find the Riser capable of long flights and precision landings, and these features will make the Riser 100 a common sight at contests.

**Here are the addresses of the manufacturers mentioned in this article:*

Sig Manufacturing Co., 401 S. Front St., Montezuma, IA 50171.

MonoKote; distributed by Top Flite Models, 2635 S. Wabash Ave., Chicago, IL 60616. ■

HELI CHALLENGE

(Continued from page 77)

point where it would intersect the ground just past where you're standing. Shoot a couple of approaches from this altitude and abort the descent when the helicopter gets down to around 15 feet by advancing the throttle and flying around in a circle to set up for another practice approach. The helicopter will be coming down pointed right at you, so you might want to turn to one side and fly by, looking at the helicopter over one shoulder to help keep you from becoming disoriented, since, in this attitude, you'll have the sensation of the controls being reversed.

Now that you're completely in control of your "dummy" descents, consider attempting a full-down landing. To give yourself more time, set up in your circle a little further out than you've been practicing. Imagine a line from the helicopter to a spot on the ground just past you. Begin to slowly reduce the throttle until the helicopter drops along your imaginary line. As the machine comes down the line, add a slight amount of throttle to see if you can get it to climb slightly. This practice will ensure that the helicopter isn't hanging just above a stall. I almost always play with the throttle as the helicopter comes down, trying to find the perfect rate of descent.

Continue to allow the helicopter to come down. The machine should fly past you at about the level of your head. At this time, you'll need to start gradually opening the throttle. Try to ease the machine almost back into a hover by pulling back on cyclic as you did when stopping from the slow circle you flew around yourself in hover practice. (See, you've done this before!) I think that the first few landings should be just that. Allow the helicopter to settle all the way to the ground. This way you won't be trying to control the tail rotor as much as you would if you were trying to re-enter a hover, and you might be slightly dazed from the excitement and forget what's happening! The key to getting the machine back to the ground easily is getting its speed into a manageable range. If the helicopter is too fast, it won't come down; if it's too slow, it will stall. Practice until you can get up and down without being jerky with the controls. You'll discover that the tail rotor will have a tendency to jump whenever you suddenly move the throttle. This can make situations like having the helicopter turn and point its nose right at you seem a little precarious when you're flying at altitude!

Don't panic if you get into trouble; just open the throttle smoothly and fly around. Practice, practice, practice. Don't get carried away and run out of fuel while you're having all this fun, and, if possible, have an experienced pilot standing by.

That's it! Pretty soon you'll be wondering what all the mystery was about. You might even wonder why you waited so long to try it. I have a few friends who have avoided this step for years, and I don't think they know what they're missing. *(You know who you are!)* So have fun and challenge yourself to do better all the time.

Next month, we'll take a look at some advanced flying techniques to prepare for basic aerobatics. See you then. ■

BUILDING PLANES

(Continued from page 79)

white posterboard the same size as the wing blank. (This can be in two pieces, if necessary.) Now, with one or two wide, elastic bandages, tightly wrap the whole works (mold, balsa and posterboard) and let it dry for at least a day. (This step is necessary to equalize the moisture content throughout the balsa and to make its steam-formed airfoil permanent.)

After drying, cut the wing to outline (tapered at the trailing edge and "radiused" along the leading edge), then sand it smooth for whatever type of finish you prefer. Because it prevents distortion of the airfoil during these operations, the forming mold makes an excellent support for the wing while you sand it and make the dihedral joint.

In my next column, I'll talk about built-up wing construction and outline some quick and easy ways to accomplish what most modelers consider to be the most boring activity in modeling. Until then, remember that your letters are always welcome, because I need your input!

**Here are the addresses of the manufacturers mentioned in this article:*

Ace R/C Inc., 116 W. 19th St., Box 511C, Higginsville, MO 64037.

Master Airscrew; distributed by Windsor Propeller Co., 348 Tesconi Ct., Santa Rosa, CA 95401.

FAI Model Supply, P.O. Box 3957, Torrance, CA 90510. ■

QUIET FLIGHT

(Continued from page 82)

over with the T-bar. You'll really be amazed at how well it levels out sheet wood and glue joints.

Next, the entire model should be sanded, first with 180-grit, then 220-grit and, finally, 320-grit sandpaper. If you want a decent-looking model, you have to use a little elbow grease; no matter how carefully you apply your covering, your model will only look as good as its

sanding.

When choosing your color scheme, pick colors that you're able to see easily against the sky. Remember that on some days the sky will look light blue, on others, grey, and on others, white with cloud cover. Red is the best color for me, and some people like the bottom of their model finished in black. If you're still having trouble with orientation, you should put a large contrasting stripe on the right wing, as this will help you to determine whether your model is going away or coming toward you.

When the entire model has been covered, glue the tail surfaces to the fuselage, making sure everything is square. If everything isn't straight, your model will be difficult to fly.

Next month, I'll show you some pictures of the finished model and the radio installation, and I'll discuss trimming and flying.

Till then... good thermals and a full charge.

**Here are the addresses pertinent to this article:*

Chuck Anderson, P.O. Box 305, Tullahoma, TN 37388.

Douglas Aircraft, P.O. Box 92472, Long Beach, CA 90809.

JM Lupperger Plans, 1304 Palm Ave., Huntington Beach, CA 92648. ■

PATTERN MATTERS

(Continued from page 86)

tween idle and full power. Broad range, huh? Actually, the pipe boost range on our pattern engines is about 9000rpm to 13000rpm on the FAI ships, and about 12000 to 16000rpm on the fast AMA ships. This equates to about a 25-percent to 30-percent boost range for our ships. I mentioned that the poor person in C/L speed is looking at a 2-percent range in boost, or about 28000 to 30500rpm. Above or below that figure, the engine just isn't with the program. It's this range of boost that dictates the general shape of the pipe and the taper of the chamber. The milder the taper of the chamber, the broader the boost range and the less critical the engine is to operating range. This also means that you receive less overall boost, but enough to more than compensate for the price of using a muffler instead. The more highly tapered the chamber and the shorter the pipe, the narrower the boost range and the "peakier" the engine's operating range. If you fly a full bore all the time, then this would suit you just dandy.

Lastly, the stinger, or tip, of the pipe has

(Continued on page 119)

PATTERN MATTERS

(Continued from page 113)

something to do with the pipe performance. On racing bikes, the stinger is used to fine-tune the chamber and smooth out peaky spots on the performance curve. Our tuned pipes work the same way. Suffice it to say that you should leave the stinger portion alone, so you don't de-tune the overall performance of the pipe. This little guy sets up just the right amount of back-pressure to the rear of the chamber and ensures an even, measured flow of gases out of the pipe. It's for this reason that, if you need to attach an exhaust extension to the back of a tuned pipe, make sure that the extension has at least the same size, if not a larger, inside diameter than the stinger. A smaller diameter will choke the pipe.

Enough about tuned pipes. It pays to use the correct pipe for the intended purpose. For pattern, I use a pipe made specifically for my engine. I don't think that there are any pilots out there using racing engines for pattern, but for the most common engines we use, the engine manufacturers recommend a pipe that fits our purposes, and this is really good advice.

Called the Beetle, the latest new pattern bird from the Far East is designed by Akiba. It appears to be a modified Aurora that has a plug stab, a slightly larger rudder, a slightly modified belly pan at the nose, a minor amount of anhedral in the horizontal stab, and the sweep taken out of the trailing edge of the wing. With a wingspan of 67 inches and wing area of 790 squares, this one will begin showing up in kit form under the MK Aircraft trademark; its ready-made form will be made by Ten-Plus Aircraft. No prices at this time, but it sure makes me wonder about those changes. Why, I could have *sworn* that when I wrote the changes down and then the notes disappeared, this kit showed up right after that! I mean, there I was, on the pipe and airborne, when...See you next time.

**Here's the address of the company mentioned in this article:*

Ten-Plus, 9949 Tabor Place, Santa Fe Springs, CA 90670. ■

ABOUT ENGINES

(Continued from page 89)

verage one. It may also lengthen engine ife, but I haven't yet run the motors nough to determine this for certain. I'm appy with the process, because I now ave a set of consistently good motors, nd I'm spoiled for choice these days as

(Continued on page 122)

ABOUT ENGINES

(Continued from page 119)

to which ones to use in my airplanes."

I'm very grateful to Alan for his highly informative letter (which I've condensed somewhat). I'm always eager to hear from fellow model engine experimenters, because no one knows everything there is to know about model engines. There are so many variables and configurations and interactions between components! But by sharing information, we'll all increase the total fund of knowledge in this intriguing and challenging field.

(The slow running-in procedure described above should *never* be used for ABC- or AAC-type engines. These have a totally different design methodology from steel-cylinder model motors. For best results with these engines, follow the manufacturer's instructions implicitly.)

A long, slow break-in is particularly important for any model engine with an unplated steel or iron cylinder bore. Whether its piston is ringed or of the "lapped" variety, during running, rapid motion occurs between two iron-alloy surfaces at elevated temperatures. When these are allowed to gradually "mate" at slow speeds, they smooth and polish and harden each other. But if, instead, the new engine is run at high speed from the beginning, the mating surfaces within the cylinder are quite likely to gall in places. They mate to one another by scuffing and scoring, as can easily be seen on the piston's surface.

I've come up with a rough rule of thumb regarding engine break-in: Every hour of slow, easy preparation when an engine is new means approximately *two years* of additional useful life.

Of course, all this running-in is far more conveniently done on a test stand than in a model, but few modelers have a good engine test bench, although it's not at all difficult to set one up. Mine is simple, easily portable (it fits nicely under the hood of my ancient VW), yet sturdy and massive enough for anything up to Quadra size. Perhaps its best feature is its method of clamping model motors into place, which allows mounting and de-mounting muffler-equipped engines quickly, without having to remove and replace the muffler!

If you're interested in how I accomplish all this, let me know. If the response is sufficient, I'll give details of my stand in an upcoming issue. Waiting to hear from you! ■

GOLDEN AGE

(Continued from page 97)

carrying on an established tradition.

This "Rolls Royce" of single-channel equipment provided one analog channel that operated a feedback servo for proportional rudder. Engine control was also available via an escapement that was operated by modulation omission; you momentarily stopped the rudder analog coding with a "quick-blip" switch, and that would trip the escapement. In search of a simple means to obtain another control, these early radio pioneers thought nothing of shutting off one control to operate another—momentarily, of course! As with the "full-house" 404, separate rudder trim was provided, and this was unusually sophisticated for single-channel equipment! Also unusual was the superhet receiver circuit; in effect, the Starlite 200 had all the ingredients single-channel could have hoped for. As a matter of fact, it would be difficult to produce a single-channel system *today* with superior features!

Sampey had also apparently met the analog discriminator need with what was called "dual reactance filters." These

(Continued on page 129)

Classified

WANTED: RTF U-Control planes from Cox, WenMac, Comet, Aurora, Testors, etc., complete or pieces, buy or trade. John Fietze, P.O. Box 593, Lynbrook, NY 11563.

WANTED: Model airplane engines and model race cars made before 1950. Jim Clem, 1201 E. 10, P.O. Box 524, Sand Springs, OK 74063; (918) 245-3649.

SCALE DOCUMENTATION: Plan Enlarging. Photo packs, 3-view drawings for 1,600 aircraft. Super-scale R/C plans for Giant, Sport. 60-page catalog $4. Scale Plans and Photo Service, 3209 Madison Ave., Greensboro, NC 27403; (919) 292-5239.

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Send ad and payment to *Model Airplane News,* 251 Danbury Rd., Wilton, CT 06897. **Non-Commercial classified ads** (commercial ads of any kind not accepted at this special rate). Rate: 15 words or less, $4.50 payable in advance. No charge for name and address. Additional words, 25¢ each. **Commercial classified ads** (rate applies to anyone selling on a commercial basis—retailers, manufacturers, etc.) Rate: 50¢ per word, payable in advance. Count all initials, numbers, name, address, city and state, zip and phone number. **Closing Date** for either type of ad is the 20th of the third preceding month (for example, January 20th for the April issue). We do not furnish box numbers. If you would like your ad to run in more than one issue, multiply amount of payment by number of months that ad is to run. It is not our policy to send sample copies of tear sheets.

GOLDEN AGE

(Continued from page 122)

discriminator filters must have consisted of a tuned coil plus some transistors, etc., and were produced in modular form. Labeled DDM-1, these demodulation discriminator modules were featured in the Sampey ads.

Sampey was a major commercial effort in early R/C. With rapid advances in electronics, we saw so many of these blood-and-sweat operations come and go, but they were the *foundation* of R/C! When a new acquaintance asks what good has come of our space program, show him how smart you are by telling him that space-research technology has quickly advanced our hobby.

To complete the history of analog, I'll discuss the successful Orbit system; in its two forms, it was probably the most widely used of all. However, there may be *other* interesting analog systems that *you* know about and I overlooked, so, as always, *your* input would be greatly appreciated.

Your OT Place

Olin McDaniel of Florence, SC, checked in with interesting personal experiences and a request for information. Olin is another returning R/Cer who flew from '57 to '63 and is now back with more enthusiasm than ever. The reason for his "vacation" is interesting, and will perhaps ring a bell with some of you.

Olin had been successfully flying single channel with various Live Wires for several years. Feeling adventurous, he decided his next step would be multi, so he spent much time building a Stormer. When it was time to buy a radio, the current hoopla was about the coming of proportional, while reeds were still king. With propo on the horizon, a big investment in a reed system seemed like a foolish move, so Olin pondered a *logical* move.

A number of outlets offered embryonic, U-Build-It propo systems, so he opted for that approach. Before he'd finished, Olin spent many long hours at his workbench with several varieties of home-builts, but he never achieved the reliability he thought necessary. As is often the case with this type of frustration, he stored all his R/C equipment and simply walked away to other more relaxing interests!

With a renewed interest in R/C 25 years later, what could be more logical than to take the completed, but unflown, Stormer

(Continued on page 138)

MODEL AIRPLANE NEWS

HOBBY SHOP DIRECTORY

Retailers: Make your business grow with new traffic! Now you can advertise your hobby shop in the **Model Airplane News Hobby Shop Directory.** The listing will be published monthly and will be listed according to city and state. You will have 3 to 4 lines, approximately 20 words, in which to deliver your sales message, plus space for your store's name, address, and telephone number.

HOBBY SHOPS: Act now and get first ad free!
Directory space is sold on a yearly basis with a choice of three payment plans: 1. $179 per year, payable in advance; 2. $97 for six months, payable in advance; or 3. $17.50 per month to be billed monthly. Space reservations must be received by the 20th of the third month preceding publication (for example, January 15th for the April issue).

CONNECTICUT—Bristol
15 minutes from Hartford. Complete stock of R/C boats, cars, airplanes, and helicopters. Also, two-and four-cycle engines. All major items discounted. Hours: Mon., Tue., Wed., 10-7; Thu., Fri., 10-8; Sat., 10-5:30; Sun. Nov.-Jan. 1-4.
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Send sales message and payment to **Model Airplane News Hobby Shop Directory,** 251 Danbury Rd., Wilton, CT 06897.
For further details or information on our special introductory offer, call toll-free 1-800-243-6685 and ask for Katherine Tolliver.

Club of the Month

Sun Dancers R/C Club

The Sun Dancers R/C Club of Port St. Lucie, FL, is the *Model Airplane News* Club of the Month for March 1989.

While flying in our part of the country (the Northeast) is still on hold, the people in Port St. Lucie have just finished their Fall Festival at the RC World facility in Orlando, and they have an entire "winter" of flying still ahead of them.

A perpetually warm climate allows the Sun Dancers to enjoy year-round flying, and they also offer the usual services of a top-notch club: Two flight instructors assist the newer, less experienced pilots—eight of them, when their most current newsletter was published. Club members also enjoy regular fun flys at their own field or at a neighboring field.

The Sun Dancers' monthly newsletter, "The Tale Spinner," is edited by members Larry Olsen, Bob Sanderson and Sue Ballard. It's apparent from its contents that the Sun Dancers have a large number of enthusiastic pattern fliers. "Prop Wash," a column by Larry Olsen, tells about the future happenings at the club and answers questions that inexperienced pattern fliers might have about the execution of maneuvers.

It's with great pleasure that we at *Model Airplane News* award the Sun Dancers two free one-year subscriptions to be awarded by them to a couple of the club's outstanding members. ■

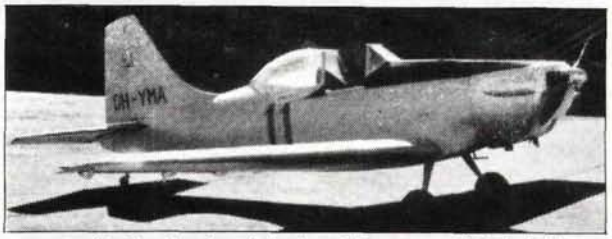
Each month **Model Airplane News** will select the club newsletter that best shows the club's activities and energies directed toward the furtherance of the hobby. The award is not based on size or quality of the newsletter, and can be about any aspect of the hobby (F/F, C/L, R/C, boating, cars, etc.). **Model Airplane News** will award two free one-year subscriptions to be given by the club to outstanding junior members. So send your newsletter to **Model Airplane News,** Club of the Month Contest, 251 Danbury Rd., Wilton, CT 06897. ■

NAME THE PLANE CONTEST

Can you identify this aircraft?

If so, send your answer to Model Airplane News, Name the Plane Contest (state issue in which plane appeared), 251 Danbury Rd., Wilton, CT 06897.

Congratulations to Kalevi Sundqvist of Ylojarvi, Finland, for correctly identifying the PIK-11 as our January mystery airplane. Kalevi's entry was chosen from the four correct answers received, two of which were from Finland. The PIK-11 was designed and built by members of the Flying Club of the Finnish Institute of Technology and first flew in March 1953. It was of all-wood construction, spanned 26 feet, and was powered by a single 65hp Continental engine, although some reports indicate that a 40hp type may have been originally employed. Kalevi also volunteered the information that the airplane was nicknamed "Tumppu," which means "knitted winter glove"! The example shown in our picture, registration OH-YMA, is



now on display in the Aviation Museum of Helsinki-Vantaa Airport in Finland.

The winner will be drawn four weeks following publication from correct answers received by postcard delivered by U.S. Mail and will receive a free one-year subscription to Model Airplane News. If already a subscriber, the winner will receive a free one-year extension of his subscription.

GOLDEN AGE

(Continued from page 129)

out of storage, then to strip off the original nylon, dope-filled fabric and to re-cover the plane with modern film. With the addition of a modern engine and radio, he'd *fly*. At this point, a "clinker" or two entered the story. First, Olin had *never* flown multi, so he needed training help from some local experts. Second, while Spreng's Stormer was a docile, fine flier, Olin's was a takeoff from the original design and used a very early type of fiberglass for the fuselage. To shorten the story, Olin's version proved to be so nasty in flight that it was almost impossible to handle. But thanks to the experts, his problems were solved. With the mods, the performance achieved must be a match for Doug Spreng's. Olin wonders if modern R/Cers know what fine planes many of these OT designs are, and of course this is what we hear every day from proponents of OT R/C!

Now to Olin's quest. He says he bought the fiberglass Stormer "kit" in 1960, in Orangeburg, SC, from a man of about 50 years old (28 years ago). He hasn't been able to find this man again, and he's interested in the fiberglass molds, if they still exist. How about it? Do any of you other "rebels" have any clues? I just wish Jim Thrift was still with us; bet *he'd* have some ideas.

Olin goes on to say that he thought he needed a trainer model. So, he took an original Live Wire Champion out of his storeroom (wonder how many other oldie-goodies he has stashed away?) and refurbished it à la the Stormer. He recently test-flew it and had takeoff problems, because the Champ gear placement was for prop protection and hand-launching was expected. Olin says he added a steerable tail wheel that allows easy takeoffs. He says the Champ was just what he needed, i.e., docile enough to match his rusty reflexes (just releasing the controls allows the Champ to fly itself out of absurd situations). Olin is fast getting flight time to sharpen him for the desired multi flying for which he has waited over 25 years!

Along the way, old flying buddies keep coming in from the pasture, out of holes in the wall or whatever, and it's always great to hear from them and to hear what they're doing. Cleveland has always been a hotbed of modeling; we held a lot of C/L competitions there and, later, many early R/C flying sessions. Alex Lekon was always to the fore with early Cleveland R/C, and he sent us a couple of pics of his '50s Demon, which apparently was the most consistent flier in the area at th time. It was .09 Arden-powered usin John Worth's Control Research radi unlike others, Alex says it piled up man flights with few problems. Perhap Warren Plohr's knowledge of electronic assisted. (Alex grew up with R/C and int the local area pattern wars.)

Alex is now a resident of Greenvill PA, which boasts a long history c modeling. Still active in pattern, he hope to get back on the contest circuit ne season. Old warriors continue to enjoy!

I recently recounted a Sony Energyte announcement about the introduction c vastly superior manganese oxide storag batteries. Joe Beshar contacted Sony i Japan for further information, and Son replied that it's working to establish production program for them. I hop they'll be available by the end of th year—first, in the AA size. Perhaps th "super battery" talk will finally reach it punch line! Thanks Joe, for the follow-up

Did you respond to Joe Beshar's* O R/C Organization announcement? Time i important; just a postcard will do!

Out of time for Old Time—'til *nex* time!

**You can write to Joe Beshar at 198 Merri Dr., Oradell, NJ 07649.*

ADVERTISER INDEX